The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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Contents

NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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Chemical Interests in Parliament

WHATEVER view may be taken of the general result of the appeal to the country, the losses to the chemical industry on the personal side have been serious, though fortunately alleviated by one or two notable gains. Colonel Sir Edward Brotherton and Mr. W. J. U. Woolcock, who both sat in the last Parliament, did not seek re-election. Sir Edward, though not a prominent figure in debates, had a reserve of experience and knowledge which was available in case of need, while Mr. Woolcock, in addition to playing a great part as organiser, frequently appeared as a most persuasive and resourceful speaker. Though out of Parliament he will doubtless remain in touch with political movements and his rare Parliamentary experience and connections will still fortunately be at the service of the industry. Sir William Pearce, who had been a member of the House for a number of years, failed to secure re-election for the Limehouse Division of Stepney. This is a particularly serious loss because Sir William was always regarded in the House as peculiarly able to give members sound guidance on matters connected with chemical industry. The absence from the House of the Rt. Hon. J. W. Wilson is to be regretted on wider grounds. Mr. Wilson had been a member for many years and was very highly esteemed in every quarter of the House. Like Sir William Pearce he was frequently called upon to preside over Standing Committees of the House, and in addition he was one of the Deputy Chairmen when the whole House went into Committee. The House is the weaker for the lack of the wide experience of administrative affairs possessed by these ex-members. Everyone connected with the industry will also regret the absence of Sir John Brunner who put up a remarkably good fight at Southport, bringing a majority of 8,980 down to 1,665. On the other hand, there are two newcomers who will be welcomed in the House and who can be relied on when matters of importance to the industry are under discussion. Dr. G. C. Clayton, a director of the United Alkali Company, who defeated Mr. Henderson at Widnes, and Mr. C. S. Garland, prominently associated with the gas mantle industry, who won the seat at South Islington, are both men with an intimate acquaintance with the needs of the industry and moreover are the type of men who almost invariably get the ear of the House. Sir Alfred Mond, released from the cares of office, may safely be counted on as a good fighter and well-informed critic of any ill-digested attempts at legislation affecting the industry. Other members more or less interested in chemical and allied industries are Mr. R. Clarry (Newport), who served during the war in the High Explosive Department of the Ministry of Munitions, Sir Frank Sanderson, founder of the firm of Wray, Sanderson, & Co., seed crushers, and the Humber Fishing and Fish Manure Co., Sir R. B. Bird, chairman of the well-known firm of Birmingham manufacturing chemists, and a few others.

It is difficult to forecast precisely what will be the attitude of the present Government towards legislation which is already on the Statute Book and to certain Bills which automatically drop with the commencement of a new Session. It seems reasonably certain, however, that with a Government pledged to interfere as little as possible with the recovery of trade there will be a cessation of the introduction of bills of the type of the Smoke Abatement Bill. Measures in themselves desirable from many points of view will have to wait till the country has recovered its economic stability. While the Prime Minister has given an undertaking that no general system of tariff protection will be introduced there seems no likelihood of any attempt to repeal the Dyestuffs Act or the Safeguarding of Industries Act. The Election would appear to show that the influence of those who led the attack on these two Acts has been quite disproportionate to the publicity their activities gained. It is, in fact, significant that four of the most active Parliamentary critics—Major Barnes, Sir W. Barton, Mr. J. D. Kiley, and Mr. Stanley Holmes—have all been unsuccessful. The greater assurance now promised will act as an

incentive to the Dyestuff and Fine Chemical Manufacturers to proceed with their plans for the development of these two branches of the chemical industry in this country. The uncertainty of the past few months has no doubt resulted in some hesitation on the part of manufacturers as to embarking on the expenditure of money on plant and equipment generally. This uncertainty being removed we can look forward to a further step in the recovery from the slump of two years ago.

In the hurry of collecting the latest electoral results for publication in last week's issue, we inadvertently included Sir W. Edge (Bolton) among those who had failed to secure election. We were glad to find from later returns that Sir William had been elected as the second member for Bolton (which returns two members), and we wish to add to our regret at the error our congratulations on his success.

Scientific Control of Works' Operations

At the present time in connection with all industria operations considerable attention is being given to methods of control which introduce the use of indicating or continuously recording instruments. Only within comparatively recent years has this phase of manufacturing processes attracted notice, and recognition of its value has, no doubt, sprung from the well-established principle that smoothness and uniformity of operation go hand in hand with efficiency. One of the chief values of instruments of the kind is that, as most disturbances are more or less gradual, warning of them is given while they are still in their incipient stages, so that an opportunity is provided for dealing summarily with any dislocation so soon as it is noticed. There has unfortunately been in some quarters a disposition to regard recording instruments purely as a means for checking the assiduity with which employees carry out their duties; and although instruments of the kind undoubtedly have their uses for such purposes, it should be emphasised that their main function is to give adequate warning of any disturbance of the process or deviation from the normal. Accordingly, attention is drawn to derangements which might otherwise remain undetected, so that the origin of the trouble may be sought for and steps taken to preclude its recurrence. It will not be gainsaid that in many industrial operations a stage has been reached when little improvement on present results can be expected with the methods now employed. Progress, therefore, must be largely dependent upon attention being given to hitherto neglected details; and such details cannot be accorded the attention they demand by existing staffs unless the latter are equipped with instruments of a self-acting "tell-tale" variety. It is not, of course, intended to give the impression that the average works is as yet in a position to carry refinement of operation to its full length by employing a multiplicity of scientific instruments, but the time has come when it should be recognised that these instruments have reached such a stage of development that the direct assistance they can afford to the management is too obvious and valuable an asset to be neglected.

This week's issue of The Chemical Age is more particularly concerned with the scientific control of works' operations by means of instruments which in some instances may be characterised as little less than human. Dr. Leonard Levy, who is well-known as the leading expert on the theory and construction of many forms of these instruments, contributes an article dealing generally with the uses to which they may be put. It is a coincidence, too, that the past week should have seen the publication of Dr. Levy's comprehensive volume on "Gasworks Recorders" which forms one of Benn Brothers "Gas and Fuel" series, and which is the only book of the kind which has yet been written. For the benefit of our readers we must point out that they should not be misled by the title of this volume, for although it relates to instruments commonly employed, or capable of employment, on gasworks it has to be borne in mind that modern gas manufacture is purely a chemical engineering operation —particularly when consideration is given to the working-up of the numerous by-products—and the devices which the gas engineer finds a use for are equally applicable to the ordinary chemical or metallurgical works. As Dr. Levy remarks, progress in any branch of knowledge is intimately connected with improvements in the accuracy with which measurements appertaining to the branch of knowledge in question can be made. The advances in electrical engineering were largely influenced by the development of measuring instruments whereby the determination of the various quantities involved could be made with great accuracy. The same correlation holds true in almost every other industry, for the operation of plant can thus be controlled with an efficiency which would be impossible by any other means.

An Overcrowded Profession

Following up a discussion on unemployment among chemists at the recent annual meeting of the British Association of Chemists, our Manchester correspondent has collected a number of interesting opinions, which are published in this issue, on the question whether the chemical profession is to-day overcrowded. The authorities quoted include Dr. Kay (Liverpool University), Dr. Herbert Levinstein, Professor Lapworth and Mr. Heap (Manchester University), Dr. Mary Cunningham and Mr. J. R. Hannay. It is generally agreed that the number of chemists leaving universities and other centres of training greatly exceeds the number of available appointments, and as a consequence from this cause alone we have a considerable volume of unemployment in the sense, not of chemists losing jobs through lack of business, but of being unable to start on a job at all. There are two classes, therefore, to be considered—the trained and competent men who through trade depression and the diminution of staffs have in considerable numbers lost their appointments, and the untrained but educated men who are seeking a first foothold in the profession or industry. Our sympathies are claimed mainly by the former class, who are the victims of misfortune, and whose prospects of recovering their lost places are in many cases none too good. There is only one remedy here, and that is a steady recovery of trade with a corresponding increase of staffs.

The problem of the other class who are unable to find openings is rather different. The alternatives are simple—either a large proportion must fail to find posts or industry must be educated into a much more liberal employment of chemists. Dr. Levenstein, whose knowledge on this point should be trustworthy and extensive, rather hints that there is not so much room as is often suggested for development in the latter direction. If so, it is creditable to industry, for though we have organisations for the promotion of chemical industry we know of no organised efforts to teach industries the duty and the advantage of utilising chemistry and to develop the habit of employing a chemical service.

The Sulphate of Ammonia Position

THE report, relating to the year ending May 31 last, which has just been issued by the British Sulphate of Ammonia Federation, forms in the main a story of remarkable contrasts. The first impression gathered is that the Federation, faced at times with a perplexing and anomalous set of conditions, always contrived to frame a policy which turned out to the ultimate advantage of the sulphate of ammonia producer. During a year when miscalculation might be pardonable and expected, the Federation seems, in fact, to have displayed unusual foresight. Towards the middle of 1921, the apparently unsaleable stocks of sulphate of ammonia (*i.e.*, British, American and foreign) amounted to nearly one-half of the total annual British production, and it was decided to reduce the price substantially, America pursuing a similar policy. In the last quarter of 1921, home demands showed very marked falling off, and consumers seemed to be holding off in the hope that prices would drop still further. There was, however, a good deal of inquiry on export account, and this had a decidedly brightening effect on the market. Early in the present year there were signs that a complete reversal of conditions might be anticipated. America had been indulging in a price-cutting campaign to attract overseas markets, and it was said that production was sold up for months ahead, and there was an undoubted shortage so far as actual American consumers were concerned. For March, April and May deliveries the Federation fixed prices of £16 per ton for ordinary quality, and £17 for neutral salt, export prices being from 10s. to 15s. higher. In the early spring a difficult position certainly arose, for farmers seemed suddenly to change their minds, with the result that the Federation was overwhelmed, but managed eventually to cope with the situation. The demand continued throughout May, and unusually large orders were received in the early part of June, and if the home consumer had to put up with a certain amount of delay and inconvenience, it should at least be a useful reminder that it does not pay to delay one's purchases indefinitely in the hope of pulling down the market. It would have been an easy—even justifiable—matter for the Committee to have raised their prices in March and April, but they had no wish to exploit a temporary scarcity to the detriment of the farmer.

Where the sulphate of ammonia market is concerned it is a difficult matter to make predictions; but, from the producers' standpoint the immediate prospects appear quite encouraging. The American strikes have had a telling effect on the quantity of American salt for disposal, while we seem as yet to feel little practical effect of the German synthetic menace. The Oppau explosion, it is said, entailed a three months' loss of production; and as Germany had during the past twelve months actually to import combined nitrogen, it is clear that she is still unable to produce a balance over her own requirements. The annual consumption of pure nitrogen in Germany is in the neighbourhood of 340,000 tons, whereas her total production from synthetic and by-product sources is estimated at 320,000 tons.

Perhaps one of the most significant points in the Federation's report is the statement that over 50 per cent. of the total production of sulphate in this country is now of the neutral quality, a fact which indicates that the British producer has lost a good deal of that apathy which at one time it was so difficult to surmount. Moreover, the Federation shows a further slight increase in membership, and it now represents over 90 per cent. of the total output of sulphate of ammonia in this country.

Books Received

BUREAU OF BIO-TECHNOLOGY. Bulletin No. 7. London: Murphy and Son, Ltd. Pp. 40.

MODERN GASWORKS CHEMISTRY. By Geoffrey Weyman. London: Benn Bros., Ltd. Pp. 184. 25s.

INCANDESCENT LIGHTING. By S. I. Levy. London: Sir Isaac Pitman and Sons, Ltd. Pp. 129. 3s.

THE CHEMISTRY OF DENTAL MATERIALS. By C. S. Gibson. London: Benn Bros., Ltd. Pp. 176. 12s. 6d.

PRACTICAL CHEMICAL PHYSIOLOGY. By W. W. Taylor. London: Edward Arnold and Co. Pp. 70. 4s.

LUBRICATION AND LUBRICANTS. By J. H. Hyde. London: Sir Isaac Pitman and Sons, Ltd. Pp. 114. 2s. 6d.

HANDBOOK OF CHEMICAL ENGINEERING. (Complete in two volumes). By Donald M. Liddell. London: McGraw Hill Book Co., Inc. Pp. 1,008. 40s.

COAL: A SERIES OF LECTURES ON COAL AND ITS UTILISATION. By the Department of Fuel, Technology, University of Sheffield. London: The Colliery Guardian Co., Ltd. Pp. 41. 5s.

SYNTHETIC COLOURING MATTERS: DYESTUFFS DERIVED FROM PYRIDINE, QUINOLINE, ACREDINE AND XANTHENE.—By J. T. Hewitt. London: Longmans, Green and Co. Pp. 405. 14s.

FOOD INVESTIGATION BOARD SPECIAL REPORT NO. 9: THE TRANSMISSION OF HEAT BY RADIATION AND CONVECTION. By the Department of Scientific and Industrial Research. London: H.M. Stationery Office. Pp. 44. 1s. 6d.

The Calendar

Nov. 27	University of Birmingham Chemical Society. "Some Chemical Aspects of Agriculture." E. Holmes.	Birmingham.
27	Royal Society of Arts. "Brown Coal and Lignites." W. A. Bone. 8 p.m.	John Street, Adelphi, London.
28	Hull Chemical and Engineering Society. R. Allan. 7.30 p.m.	The Hull Photographic Society's Rooms, Park St.
30	The Society of Dyers and Colourists (London Section). "Dyestuffs used in Photography." R. E. Crowther.	Dyer's Hall, Dowgate Hill, E.C.
Dec. 1	Society of Chemical Industry (Manchester Section). "The Chemical Engineering of Paper Manufacture." W. G. Fraser.	Textile Institute, 16, St. Mary's Parsonage.

The Control of Works Operations by Scientific Instruments

By Dr. Leonard Levy, M.A. (Cantab), F.I.C.

THE importance of the accurate control of technical operations, with respect both to the qualities of the materials employed and to the physical conditions under which the processes are carried out, is now widely recognised.

The development of many scientific methods of works control is quite modern, and is due partly to the recognition by manufacturers of the necessity of such control, and also to a concomitant activity on the part of instrument makers whereby the development of suitable instruments of precision has been achieved.

A certain amount of control by scientific instruments has been practised for very long periods; for example, thermometers and hydrometers are certainly scientific instruments, and have both been employed for very many years in checking and controlling technical processes. It is, however, a fact that even at the present day there are many works in which such relatively simple instruments might with advantage be employed, but are not used.

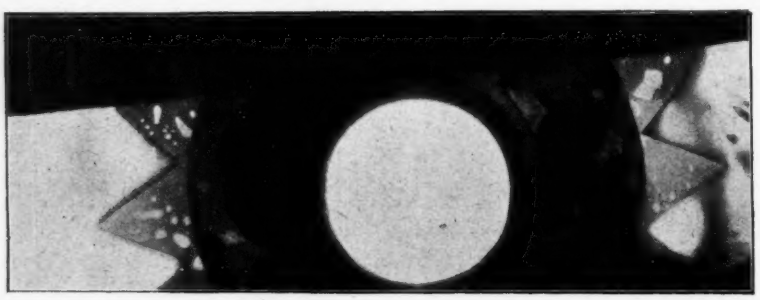

Fig. 1. Welded Steel Joint

It is obviously impossible to give, within the compass of a relatively short article, anything like a complete account of the use of the various scientific instruments available for works control, and it is, therefore, proposed to confine the following remarks to modern developments.

For the same reason it is not proposed to give any detailed description of the instruments themselves, but rather to refer merely to the way in which they are intended to be used.

Scientific instruments, designed primarily or entirely for works control purposes, are of necessity required to be employed as empirically as possible. The indication given by the instrument should, whenever possible, give the required result; as, for example, a percentage or a dimension, by simple observation of the reading obtained, or at most by reference to a set of tables. Intermediate calculations made from the reading observed on the instrument must be avoided whenever possible.

In many cases the control exercised by any particular instrument can be rendered continuous and automatic by the employment of a suitable recording appliance, and in many instances readings obtained from the automatic record will be quite as accurate as indications obtained on an indicator or by means of an operation conducted by hand.

The utility of such automatic surveillance as is obtained by the use of recorders is very great, and a short account of the use of such instruments was given by the author in an article which appeared in THE CHEMICAL AGE on November 26, 1921.

The question of the control of works operations may be considered to include :—

(*a*) The control of the quantities and qualities of the materials used.

(*b*) The control of the physical conditions under which the particular operation is carried out.

(*c*) Checking the quality of the finished product, so that anything which fails to reach a certain standard or quality is rejected.

The materials employed in any operation must conform to certain standards, which vary very widely according to the purpose for which they are intended. In some cases the mechanical strength of the material is of prime importance, in others the absence of certain impurities may be the most essential point.

Freedom from stresses and from internal flaws is also of the utmost importance in many instances.

Some of the modern methods which have been developed for the measurement and control of these and other factors will now be considered briefly.

X-Ray Examination of Materials

The development of the Coolidge X-ray tube and the possibility of thereby employing very high voltages and heavy, exciting currents, has led to the possibility of the X-ray examination of thick masses of metal and of a variety of other substances which it had previously been impossible to examine by this method.

The radiography of thick pieces of metal has necessitated the development of a special technique in order that useful results may be obtained.

One of the chief difficulties in the radiography of metals arises from so-called "secondary" radiation. When a beam of X-ray strikes any particle of matter, that particle becomes in itself a source of X-rays which radiate from it in every direction. If this takes place in the interior of a solid mass, these radiations are absorbed by the surrounding molecules, but on the surface of a body, or where the body is not very opaque to the rays, they may travel a long way before being absorbed.

In the process of taking a radiograph, therefore, the photographic plate must be shielded from this secondary radiation, which would otherwise produce a general fogging over the whole surface of the plate.

The detrimental effects of secondary radiation are always more marked with very opaque bodies, necessitating long exposures; and in the X-ray examination of metals, special attention must be paid to the suitable disposition of shields to protect the plate from the influence of secondary rays.

X-ray examination is largely employed for testing aeroplane parts, in which a slight flaw might easily have the most serious consequences. Flaws and blow holes in castings and welds are shown up very clearly, porous places show as well-defined light patches. The quality of electric and acetylene welds can easily be determined. When the union is incomplete the edges of original plates can be distinctly seen, whereas in a good weld the boundary between the plate and the added material completely vanishes.

Fig. 2. Showing Weld in Mild Steel

Radiographs of alloys also show if there is any lack of homogeneity—an uneven distribution of a constituent shows plainly as a patchy structure. Timber can be examined up to 18 inches thick. Internal knots, resin pockets, cracks and grub holes are easily seen. Figs. 1 and 2 are examples of such radiographs.

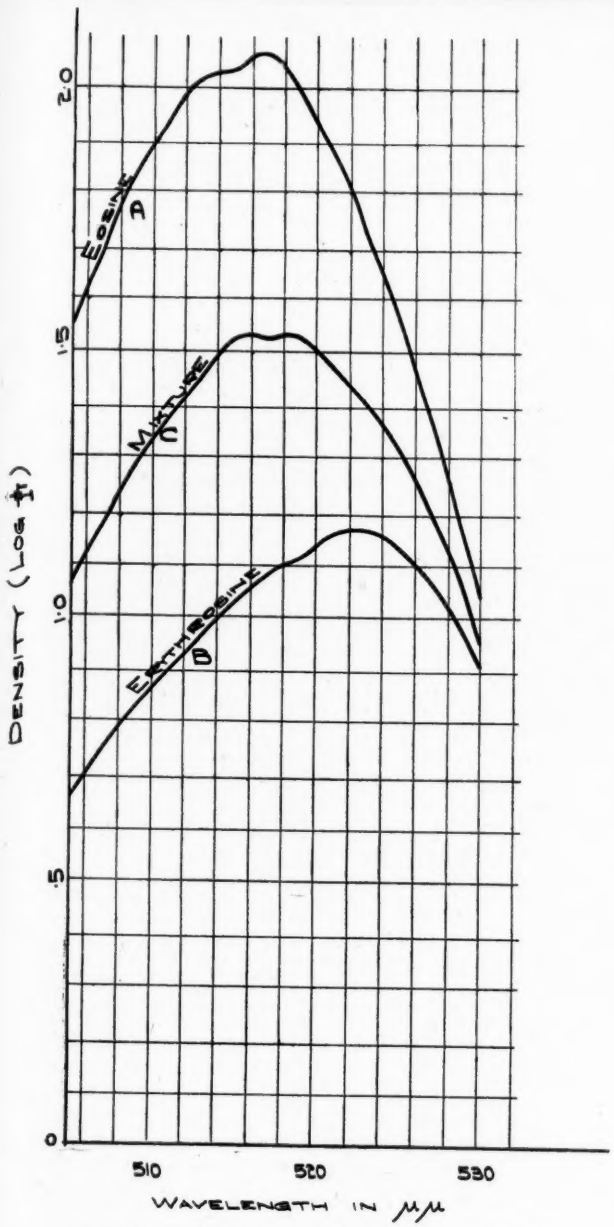

Fig. 3. Testing of Dyes by Absorption Spectra

Fig. 2 is a weld in mild steel. The joint is good, but the metal of the plates was damaged by overheating. The radiograph shows numerous blow holes occurring in the region where the metal was very hot but not molten. Fig. 1 is a welded steel joint in an aeroplane part.

Optical Methods of Control

The control of the qualities of materials, of the sizes of parts, and of physical conditions by optical means, has been greatly developed in recent years.

Optical methods of control are usually characterised by a delicacy of precision quite unobtainable by any other means.

The presence of certain required ingredients in metallic alloys and the absence of undesirable impurities, which, if even present in only the most minute trace, may be in many instances most detrimental, can be detected with certainty by the spectroscope. Although this instrument has been known for a very long time it is only within the last ten years that any extended use of it has been made as a method of works control.

The introduction of spectrometers graduated in wave lengths, and of the quartz spectrograph, whereby a photographic record of the spectrum is obtained, has been responsible for the development of spectrum analysis as a method of works control.

The quartz spectrograph is of great utility, insomuch as very many characteristic lines occur in the ultra violet regions of the spectrum, and are, of course, only to be observed by a photographic method.

Interesting examples of the use of spectrometers and spectrographs are afforded by the detection of nickel in fats which have been hardened by the well-known catalytic process, the detection of the mercury in explosives and the control of the manufacture of photographic emulsions.

Argon and neon, which are now largely used in the electric lamp industry, are also tested spectroscopically. Recent advances have rendered it possible to effect quantitative estimations by means of the spectrometer. The method employed depends upon the fact that as the quantity of the element present in a substance is diminished, many lines due to the element cease to appear in the resulting spectrum.

Methods of quantitative analyses, based upon observations of the persistencies of the various lines in the spectrum, are likely to become of great technical importance, but the method at present is still in its infancy. Use is sometimes made of a difference in volatility; for example, a small trace of lead in copper can be estimated with considerable exactitude by observation of the time required for the lines to disappear.

Absorption spectra are also employed for works control.

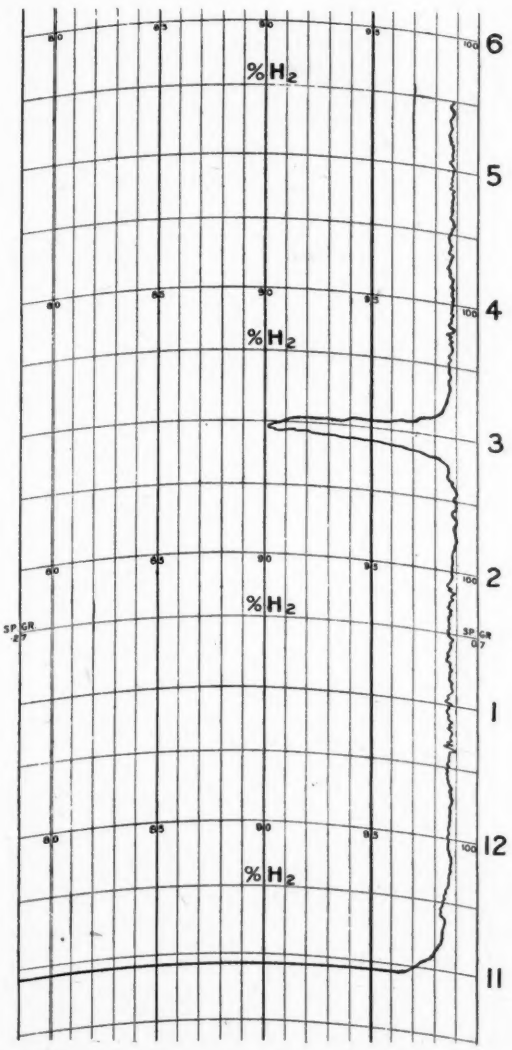

Fig. 4. A Simmance's Gravitometer Chart

Typical examples are afforded by the testing of optical glass, goggle glasses, etc., and for the analysis and identification of dyes. The method whereby a dye analysis would be conducted is shown in Fig. 3.

The Hilger wave length spectrometer with Nutting photometer is employed. A solution of known strength is prepared from a reliable sample of the dye under consideration, the strength of the solution being such as to give an accurately measurable absorption in the region of maximum absorption. A very dilute solution only is required.

This solution is then spectrophotometered—*i.e.*, its extinction co-efficient is measured for a series of wave lengths by means of the Nutting photometer used in conjunction with the Hilger Wavelength Spectrometer. The results are plotted, and the curve is kept as a permanent reference. When a sample of what purports to be the same dye is tested at any future time, a solution of equal strength by weight is made up and similarly spectrophotometered. The densities are plotted on the same sheet as the standard curve, and any non-coincidence on the two curves indicates a difference either in strength or in the nature of the dye. If the difference is in strength only (through dilution with a colourless substance such as dextrine), all the ordinates are reduced in like proportion.

Fig. 3 shows curves of solutions of eosine and erythrosine, and a mixture of the two.

The instrument can be used to measure the proportions in which two dyes are mixed. For instance, in the curve shown, A and B are the standard curves of known strengths of reliable eosine and erythrosine, and C is a mixture of the two in unknown proportions, and in which also a diluent may have been added. If m is the proportion of a in the mixture before dilution, and if the mixture be diluted by some inactive substance so that its weight before dilution is to its weight when diluted in the proportion of 1 to n, then in Fig. 3 if a, b, and c represent the ordinates of any wave length of the curves A, B and C, respectively

$$m\,(a-b)+b=cn.$$

Refractometers for the measurement of refractive indices are now instruments of the highest degree of precision, and can be with advantage employed for the determination of sugar content, for the determination of the proportion of methyl and ethyl alcohol in mixtures of these two substances, and in the essential oil industry.

The refractometer has recently been employed for controlling the mixtures of liquids or solutions forming a viscous or semi-solid product in which it is difficult to ensure a uniform dissemination of all the various constituents throughout the entire bulk of a batch of material. Many manufactured products are of this nature. Samples are taken from different portions of the batch of material and examined in the refractometer. If the figure, whatever it may be, is identical in all the samples, then, in all probability, a homogeneous product has been obtained and the mixing has been efficient. If, on the other hand, the samples differ, the mixing is almost certainly inadequate.

The polarimeter is largely employed in the sugar and jam trades.

Determination of Stress Distribution

Coker's polarised light apparatus is employed for the determination of the stress distribution in parts of machines and structures by means of observations on models constructed of transparent materials.

Specially selected celluloid is employed for this purpose, and the model made of this material is illuminated with circularly polarised light; the image is projected on a screen and inspected. At the same time the image of a loaded bar of celluloid is similarly projected, and the load is varied until the colour in this calibration bar matches that at any point along an unloaded edge of the model.

Control of Annealing

The accurate attainment of the annealing temperature for a glass is of the utmost importance. If, for example, satisfactory annealing of any particular glass at a temperature of 500° requires an hour, then, at a temperature 420,° one thousand hours would be required for the same degree of annealing to be attained. This shows the disadvantage of an insufficient temperature. There are, on the other hand, grave objections to taking the temperature too high. The glass may soften, and faulty annealing may be reintroduced as the temperature is reduced. Pyrometric control can only give an indication of the variations of temperature with the time, and cannot give the actual temperature required by the articles being annealed.

The Twyman annealing indicator is based upon the following principles :—

A test piece of the substance of which the articles to be annealed are composed is strained or deformed a definite amount by the application of external forces, and so strained, is placed with the articles in the lehr. If the constraint by which the piece is deformed is periodically removed, the proportion of the original deformation by which the test piece fails to spring back indicates the percentage perfection of annealing of the articles, always assuming, of course, that the temperature of the test piece and of the articles is the same at every stage. For instance, if the piece springs back, or recovers its original position to the extent of only one-twentieth of its original deformation, the degree of annealing is 95 per cent., by which is meant that 95 per cent. of the original stress has been removed by the annealing.

But if, instead of permitting the test piece to spring back, a constant stress of small amount is applied in such a way as to tend to increase the original deformation, then, when the release of stress by annealing has proceeded far enough, the deformation will continue to increase continuously, and can be rendered visible in any convenient way.

Testing of Screw Threads

The Wilson Projection Comparator has been devised for the rapid testing of screws or small repetition parts.

The essential part of the apparatus consists of two projection lenses side by side, these lenses being separable by micrometer screws. By means of these screws the centres of the lenses are set to the effective diameter of the screw thread under test; consequently, when this screw is in position the two lenses project images of the two opposite contours of the screw on to a screen, and these images intermesh.

The apparatus is adjusted by placing an accurate gauge in position, and so adjusting the prisms that the projected images neither overlap nor fail to touch. The screws to be tested can then rapidly be placed in position one after another. If there is an overlap of the projected images it indicates that the diameter of the part is too large, and if there is a gap the diameter is too small. The rapidity of the test is many times as great as by the older methods of gauging.

Defects in the shape of screw threads are also readily detected.

Testing of Lenses and Prisms

The Hilger Interferometer is an instrument employed for the control of the correction of lenses and prisms by the retouching which is always necessitated by the inevitable heterogeneity of the glass used. The Interferometer produces a series of interference rings which may be regarded as a "contour map" of the imperfections. The superfluous material is removed by polishing. The instrument in its simplest form resembles a Michelson interferometer, the main essential difference being that the two interfering beams of light are brought to a focus at the eye of the observer.

Various Other Methods of Control

The manufacture of coal gas is largely controlled by the use of scientific instruments, and many of these are now with advantage employed as recorders. This control is a very large subject in itself, and mention will only be made here of recording calorimeters, which have been designed to record the calorific value of the coal gas, in order that this value may always be maintained above the penalty point stipulated in the various gas acts.

The control of the manufacture of a pure gas such as hydrogen can be effected with great advantage by means of Simmance's Gravitometer. This is an instrument for automatically indicating or recording the specific gravity of a gaseous mixture corrected to standard conditions of temperature and pressure. The instrument has been largely employed in the manufacture of hydrogen, as any trace of oxygen, air or other gas exerts a large effect upon the specific gravity. The charts are scaled to read directly in percentages: an example of an actual chart running on hydrogen is shown in Fig. 4.

The fatigue-resisting quantity of metals are most readily testing by subjecting the metal to a continuous series of blows of relatively small force, which are delivered alternately on opposite sides of the test piece.

The Cambridge repeated impact testing machine has been designed for this purpose, and is arranged so that 70 to 100 blows per minute can be applied to the specimen under test. The force of the blow can be varied by alteration of the height through which the hammer falls. The specimen of metal employed in the test is supported on knife edges, the hammer striking the specimen midway between the latter. The specimen remains stationary whilst the blow is struck, but is turned to an angle of 180 degrees between the blows. The number of blows struck is registered by a revolution counter. When fracture occurs the specimen falls away and the machine is stopped automatically.

The Katharometer is an instrument devised by Shakespear for comparing the thermal conductivities of gases and gaseous mixtures. It can with advantage be employed for controlling the composition of binary gaseous mixtures, and has been used for testing the permeability of balloon fabrics towards hydrogen and helium, and for detecting dangerous mixtures near hydrogen plants. The manufacture of hydrogen and nitrogen mixtures employed in the production of synthetic ammonia is another interesting application of the instrument.

The use of viscometers is essential in the control of certain industries, the most important of which are the manufacture of lubricating oils and the production of artificial silk. In the latter industry a special type of viscometer is employed owing to the very high viscosities which have to be tested and controlled.

The extraction of radio-active materials must be followed right through the whole process by the use of a suitable electroscope. The instrument employed must be of great delicacy and must be kept quite away from where the actual works operations are carried out. If once the instrument becomes contaminated in ever so minute a degree with a trace of radio-active matter, its natural leak increases to so great an extent that it is practically useless, as it is nearly impossible to clean the instrument from such contamination. A very delicate goldleaf electroscope is employed, the observations of the rate of discharge being made through a reading microscope.

An alpha-ray electroscope is employed for the control of radium extraction and a gamma-ray instrument is used for mesothorium.

Pyrometry

Temperature control is a matter of such importance in so many industries that it is impossible to do more than merely to refer to these appliances. It is only necessary to state that the accuracy, reliability and durability of pyrometers for the measurement of elevated temperatures has been greatly improved in the last few years, and that so-called optical and radiation pyrometers of a very high degree of precision are available for the measurement of the very highest temperatures.

The advantages of thermometric and pyrometric control may be briefly summarised as follows :—

1. A general increase in the efficiency of the operation.

2. A reduction of fuel consumption by the maintenance of an adequate rather than an excessively high temperature.

3. A reduction of the time employed in the reaction for the same reason.

4. The assurance of effective control by the person in charge of the operation, due to the elimination of any uncertainty regarding the reacting temperature.

The author is indebted to Messrs. Adam Hilger, Ltd., for much information on optical methods of control ; to the Cox-Cavendish Electrical Co, Ltd., for information regarding the radiography of metal parts ; and to Messrs. Alex. Wright and Co., Ltd., and the Cambridge and Paul Instrument Co., Ltd., for other information.

GASWORKS RECORDERS. By LEONARD LEVY, D.Sc., Ph.D., F.I.C., F.C.S. London : Benn Brothers, Ltd. Pp. XI., 246. 35s.

It is a refreshing experience nowadays to come across a scientific text-book which strikes an absolutely new note. In the domain of literature dealing with everyday industrial operations one grows so accustomed to duplication of effort that it is more or less an event to meet with an author who has discovered a subject which had hitherto been untouched. Certainly, a good deal has from time to time been written about indicators and recorders—those constant and invaluable helpmeets which undoubtedly assist in making our daily round a little less harassing—but it is a very scattered and sketchy literature, and in the main we have had to rely for our information on trade catalogues which, informative as they can be, are not altogether dispassionate Moreover, trade descriptions invariably neglect to explain the theory upon which a practical appliance is based, and it is to be trusted that in the present inquisitive age none of us is prepared to take things for granted and employ apparatus the principle of which we do not understand. It is in assisting us to determine what is actually occurring that we shall find Dr. Levy's volume serviceable, for in dealing with a veritable profusion of indicating and recording instruments the author invariably commences by dissecting the working parts, describing the particular functions of each, and showing the relation of one to another. If we are going to employ recording instruments successfully it is essential that we should have a fairly intimate knowledge of the first principles upon which they operate, for, reliable as many of the modern contrivances are, they are all more or less of delicate construction, and at times they suffer from disorders which may be particularly difficult to diagnose.

It is the writer's view that Dr. Levy's book will mainly be found invaluable, not as a mere descriptive treatise, but for the guidance of those in whose hands the care of the instruments on some particular work rests. Many will be of the opinion that the title which the author has given his book is a little ill-chosen. The impression is gained that he has written solely for the instruction of those whose sphere lies in a particular branch of technology, namely, the complicated procedure involved in the control of the modern gasworks. The choice of title has, however, probably been influenced by the fact that the book forms a member of what appears to be a very original and exhaustive " Gas and Fuel " series ; but a casual survey of the contents is sufficient to show that the diverse processes which are associated with the carbonisation of coal and the working-up of by-products provide opportunities for the employment of almost every conceivable form of recording and indicating instrument. It should be emphasised, therefore, that Dr. Levy's information is not by any means solely appropriate for consumption by gas engineers. It should appeal with equal force to the majority of those who are concerned with industrial chemical processes of all descriptions. As an example of the more general apparatus which is covered we might pick out those chapters which deal with recording pyrometers, specific gravity apparatus, selective gas analysers, volume recorders, densimeters and depth gauges, and pressure and vacuum recorders.

Dr. Levy has made the most of the opportunity with which the new conditions governing gas supply have provided him, and now that we have his guidance on the selection and use of these important instruments it is difficult to understand how hitherto we have been able to get along without it. It is the duty of those in authority in gas and chemical works to see that their staffs are provided with this book, for it will teach them to appreciate how, by the observation of details, money—and no insignificant amount of it—can be saved. A. M.

Practical Pyrometry for Chemical Works

By "Works Chemist"

ACCURATE temperature measurement and temperature control are absolutely essential for the successful manipulation of numerous chemical and allied processes, and although the ordinary thermometer is a useful instrument for the measurement of the lower temperatures it suffers from the great drawback of being much too fragile for works purposes. Moreover even nitrogen filled thermometers are not accurate for the measurement of temperatures exceeding some 600° C., so that other means of measurement must be utilised to control higher temperatures and to avoid the possibilities of serious damage resulting from the presence of broken glass or mercury, due to the breaking of a thermometer.

In many processes it is not essential to know the exact temperature of an article, in terms of degrees, so long as the relative temperature is known. Accordingly, many simple methods are frequently utilised for this purpose. One of the earliest and most primitive methods of temperature control of this description was that frequently employed by pottery manufacturers who found that certain clays would contract to a degree roughly proportionate to the temperature to which they were subjected. This method, although decidedly crude and approximate, gave fairly satisfactory results for this particular purpose and may still be employed in some of our smaller pottery works. Many similar approximate methods have been employed for other purposes, and those which depend upon the melting or freezing points of various salts or metals are still occasionally used, whilst various chemicals which change colour at certain temperatures —generally mercury compounds—have also met with moderate success in industrial applications and are useful, for example, for indicating if an engine bearing is "running hot." Scores of ideas similar to the above have been employed for particular purposes, but it is obvious that they do not allow of universal application and are much too crude and approximate for controlling any delicate chemical reaction.

Optical and radiation pyrometers have been evolved and are used with considerable success but, generally speaking, they possess certain disadvantages which seriously limit their scope. For example, if an optical pyrometer be used for estimating the temperature of a crucible of molten metal it generally happens that the surface of the metal is hotter than the bulk, owing to oxidation, and so an erroneous result is obtained, whilst radiation pyrometers may be influenced by heat other than that which it is desired to measure. The third method is undoubtedly the best and most accurate one, and as it has met with the most universal applications the writer will confine his remarks to the description of this excellent and extremely accurate method of temperature measurement, and at the same time indicate some of its disadvantages and probable future developments.

Electromotive Force

This pyrometric method depends upon the fact that if two dissimilar metals are joined at a point and the junction is heated, a small electromotive force is set up which is proportionate to the temperature to which the point is heated. It is, therefore, only necessary to make a suitable thermo-couple and measure the small E.M.F. generated therein by means of a delicate galvanometer, when a scale may conveniently be graduated in terms of temperature degrees, or in milli-volts, and a graph drawn up giving the equivalent E.M.F. for any desired temperature, for any particular couple. This method has been so developed that practically foolproof pyrometers are now obtainable which will give quick and accurate results under works conditions when in the control of ordinary workmen of average intelligence. If a delicate mirror galvanometer be used, in place of the ordinary type of instrument, for the measurement of the current produced in the thermo-couple, then readings which are accurate to a fraction of one degree may be obtained, provided the delicate instrument be very carefully insulated from all vibration, which may suitably be achieved by means of suspending the instrument in properly designed oil baths. Such accuracy is, of course, only obtainable in the laboratory, and as works practice does not call for any such "hair splitting" results we will not discuss this academic temperature measurement process any further.

Thermo-couples composed of different metals give different results and produce varying E.M.F., therefore the choice of a suitable couple is important, and different couples are preferably used for low and high temperature measurement. It is, of course, obvious that the melting point of either metal employed for the thermo-couple must be considerably higher than the maximum temperature it is liable to be called upon to indicate, whilst it is also essential that the E.M.F. developed must be constantly proportionate to the temperature. Moreover couples should be chosen which will resist the effects of both prolonged heating and repeated and alternative heatings and coolings. All couples become affected by heat sooner or later, and the metal crystallises, which alters the E.M.F. developed. Oxidising, sulphurous, acid, and other gases also tend to destroy couples, hence it is essential that thermo-couples be carefully selected according to the duties they must perform, whilst their life will largely depend upon the precautions taken to prevent the ravages of the aforementioned gases.

Probably the best couple of all is one composed of a platinum wire and a platinum-rhodium wire. This couple gives excellent service, and is accurate over a very large range of temperatures. It is, however, rather too expensive for most works purposes, but an excellent plan is to keep an accurately calibrated pyrometer of this description with which periodically to check the base-metal couples in use throughout the works. A base-metal couple which gives good results for estimating moderately low temperatures is made up of a copper and a constantan wire—the latter being an alloy of 40 per cent. nickel and 60 per cent. copper. Suitable thermo-couples for measuring temperatures up to about 900° C. are made from a nickel wire opposed to a nickel-chromium alloy wire or to other patented alloy wires, such as chromel or alumel. These wires may be welded together at the hot-junction end; but as this is rather a difficult process to perform it is, perhaps, advisable to solder them together with silver solder. A comparatively recent development in pyrometer construction is one in which the sheath which usually contains the two wires takes the place of one wire. An ordinary cold-drawn wrought iron or mild steel tube contains a single wire, such as constantan, and is welded to it at the end. This construction gives excellent results, and it is generally to be preferred to other couples for works practice because it is extremely robust, and because it only necessitates the insulation of one wire instead of two.

Calibration

It is scarcely necessary to discuss the construction of instruments for indicating temperatures, for most scientific instrument makers supply indicators which are specially constructed and adapted for works purposes. The "pivoted" type of instrument is perhaps the most popular and gives good results and service under rough works conditions. In this instrument pivots which work in bearings are fixed to the coil, thus delicate suspension of the coil is done away with. The resistance of an indicator should be sufficiently high, so that readings will not be unduly altered by any variation in the resistance of the circuit which may unavoidably happen in practice. A good plan to counteract this, should it occur, is to break the circuit with fine resistance wire conveniently carried in the head of the pyrometer rod. This wire may be lengthened or shortened so as to allow for these fluctuations. Recording instruments are usually very similar to ordinary indicators except that they work in conjunction with a clock-work controlled drum, on which a pen makes periodic marks; the pen taking the place of a pointer.

The calibration of thermo-couples is perhaps the most important part of all pyrometry, as on it depends the accuracy of the pyrometric installation. It is, however, quite simply carried out, and if adequate precautions are observed there is no reason for inaccuracies to occur. For low-temperature pyrometers, four calibration points are taken which are:

The temperature of boiling water ..	100° C.
,, ,, ,, aniline ..	184° C.
,, freezing point of tin	232° C.
,, ,, ,, lead	327° C.

These points are determined as follows :—The wires of the couple are firstly insulated from each other, preferably with small clay cylinders with a central hole running through. The thermo-couple is now placed in a small test-tube which is fixed in a vessel containing water in such a position that the generated steam will play round the test-tube without impinging on the couple itself. The water is now boiled, and the number of milli-volts registered by the indicator is carefully noted. The same procedure is performed with the aniline. The other two points are determined by placing the thermo-couple in a sufficiently refractory tube—such as silica, porcelain, and the like—and then placing it in the metal bath which has been heated to a few degrees above its melting point. As the metal cools the pointer of the galvanometer slowly falls till it reaches the temperature when the latent heat of fusion of the metal is evolved. At this point the pointer of the instrument stands still for an appreciable time, and this reading is taken as the freezing point of the metal. For higher temperature pyrometers this same process is performed with other metals when the following points are obtained :

The freezing point of zinc	..	419° C.
,, ,,	aluminium	658° C.
,, ,,	silver ..	961° C.
,, ,,	gold ..	1062° C.
,, ,,	copper ..	1085° C.

As gold is such an expensive metal this point may conveniently be omitted. When all these points have been carefully observed a curve is drawn up from which the galvanometer reading which corresponds to any temperature within the range calibrated may be obtained at a glance. The lower points given here may be ascertained by means of an accurate thermometer, if such can be depended upon to give correct results. The pyrometer which we described above in which the iron sheath is substituted for a wire is not conveniently calibrated by this means, but it may be accurately accomplished by means of a heated block of iron or steel in which is drilled two adjacent holes, one containing the rod to be calibrated and the other an accurate, previously calibrated, standard thermo-couple. The block is slowly heated and the two readings compared, when a further curve is prepared.

Effect of Impurities

It is essential that all the metals used for calibration purposes should be as pure as possible because small quantities of impurities affect their freezing points considerably. They should all be protected with copious quantities of wood charcoal during melting, and copper, in particular, must be very amply covered with charcoal as otherwise a different result to that given above will be obtained. Aluminium, however, must be kept apart from carbon in any form, and owing to its propensity for dissolving silicon, iron, and so forth, it should be frequently renewed.

The life of a pyrometer depends almost wholly upon the precautions taken to resist corrosion, oxidation, and so forth. Protective tubes of iron and steel are moderately efficacious, but they scale and wear out rather too quickly. Tubes made from nickel-chromium alloys give excellent results, but are somewhat expensive at present. Porcelain, silica, and similar sheaths are much too brittle for works purposes, whilst graphite sheaths, though less brittle than the aforementioned protectors, are generally so thick that they produce an undesirable lag in the registering of the temperature. They must be carefully annealed previous to immersing in hot substances, or else they may shatter. For the estimation of the temperature of molten salts and metals protective coatings of clay, graphite, and so forth, help to prolong the life of pyrometers.

In conclusion, it is, perhaps, advisable to point out that a pyrometer will only register the temperature obtaining at the point of the pyrometer rod, and, therefore, it is entirely unfair to blame the pyrometric control for failures, unless this rather obvious point is taken notice of. Satisfactory pyrometric control is largely a matter of attention to detail, and if the above-mentioned points be carefully attended to excellent results will be obtained at merely nominal cost.

Fuel Oil Burners

Comparative Advantages of Present Systems

At a meeting of the Manchester Section of the Institution of Rubber Industry, held on Monday, at the Midland Hotel, Manchester, Mr. A. F. Baillie, in the course of a paper on "Fuel Oil," pointed out that the term "crude oil" as applied to fuel oil was incorrect, because the crude petroleum oil as it issued from the well contained certain light fractions of the gasoline and kerosene series which it was not only desirable to extract from the crude by distillation on account of their higher values, but which, if left in the crude oil and used as fuel, would be a wasteful procedure, and, further, would lower the flash point.

In the consumption of fuel oil as a heating agent it was first necessary to atomise the fluid, so that it could be mixed with the necessary quantity of air to make the resultant a combustible mixture. The process of atomisation was effected by means of "fuel-oil burners." These burners were manufactured by various engineering firms and came under three systems : (1) Air-jet system ; (2) steam-jet system ; (3) pressure-jet system.

The Air-Jet System

The first system used air under pressure as an atomising agent. Low-pressure air was blown from a motor-driven fan, although for special classes of work, such as the manufacture of electrical bulbs and other white-glass ware, high-pressure air had in the past been used, and was supplied by blowers or compressors. For some particular classes of work it had been found to be an advantage to take all the air for atomising and combustion through the burner, and in this case the air was intermingled with the oil in the burner, the proportion being 207 c. ft. of air per pound of oil. Thus, due to all the air being under control, an oxidising or reducing flame could be obtained at will. For other classes of work the usual procedure was to take approximately 60 per cent. of air through the burners and induce the necessary extra quantity of air from the atmosphere.

Steam-Jet System

The steam-jet system used steam under pressure as an atomising agent. It was usual to take this steam from an auxiliary stop valve on the boiler or from a tee on the auxiliary steam line, and reduce the pressure of this steam from boiler pressure to 15 to 25 lb. per square inch. The proportion of steam required for atomising, say, Mexican fuel oil was approximately 0.3 lb. of steam per pound of oil, or, say, 1½ to 2 per cent. of the total steam evaporated.

Pressure-Jet System

The pressure-jet system, continued the lecturer, sprayed the oil under pressure by means of a steam-driven pump, and also used steam temperature to reduce the viscosity of the oil. This latter system had been developed during the last ten years to such an extent that it was recognised as the most economical system for burning oil under land and marine boilers. In this system oil was drawn from the storage tanks by means of a steam-driven pump through suction strainers, and pumped through fuel oil heaters and discharge strainers to the fuel-oil burners. The object of the suction strainers was to collect any foreign matter in the oil, so as to protect the suction and discharge valves of the pump. The object of the heaters was to raise the temperature of the oil to such a degree that the oil, when intermingled with sufficient quantities of air, was suitable for combustion. The object of the discharge strainers was that, after the oil was passed through the heaters, a certain amount of foreign matter was released, and was then trapped by these strainers so as not to choke the nozzles of the burners. The hot oil under pressure issued from the burner in the form of a fine whirling mist. The necessary air for combustion was introduced through special furnace fronts, which slightly pre-heated the air, and imparted to it a rotary motion in the opposite direction to the burner spray, in order thoroughly to intermingle and mix the oil spray and air supply, and so give complete combustion in the furnace. The quantity of air for combustion was under absolute control by means of dampers fitted to the furnace front.

Is Chemistry an Overcrowded Profession?

Some Academical and Commercial Opinions

The Manchester correspondent of THE CHEMICAL AGE *has been investigating the problem of unemployment among chemists, and has obtained a number of interesting opinions which are embodied in the following article :—*

Manchester, November 23.

I FIND among chemists a good deal of what, for want of a better description, may be termed " pained surprise " at the condition of things in their profession as disclosed at the recent annual meeting of the British Association of Chemists. I was present at that meeting, and although the question of unemployment took up a fair share of the proceedings, I think few of the members of the B.A.C. regarded the question from any other angle than that of " unemployment," pure and simple. Certainly, until Dr. F. W. Kay applied the term, not many of them suspected that the position was anything more serious than one could reasonably expect to find during a period of sustained industrial depression.

In discussing a matter of this kind, one is faced with the difficulty of the absence of comprehensive figures bearing on the extent to which unemployment exists among chemists—simply because the organisations that have the machinery, the Institute of Chemistry and the British Association of Chemists, do not by any means represent all the professional chemists in the country. Such data as are available, however, coupled with extensive inquiries, go to show that " overcrowded " does correctly describe the position in the chemical profession to-day.

The feverish demand for trained chemists during the war years created an abnormal supply which could only possibly be absorbed by an enormous demand, which, in turn, is dependent upon a vastly different outlook among British industries in regard to the chemical profession than one usually meets with at the present time. Such a change cannot be expected in a night, even under conditions of general industrial activity. How much less likely under present conditions is sufficiently obvious.

Dr. Kay, in raising the question, said chemists were coming from the universities much faster than positions could be found for them. As craft trade unions were successful in regulating the output of apprentices, he thought the British Association of Chemists, both in the interests of university students and of members themselves, should also do something in that direction. Craft unions are, of course, in a particularly favourable position to regulate supplies—so favourable, indeed, that limitation of this kind has for many years been practised, more or less successfully, in numbers of trades. Unless, however, professions attain such a degree of organisation as, for example, have medicine and the law, rigid regulation akin to that of the craft unions is hardly a practicable proposition. In the case of the chemical profession, as things are at present the responsibility for restricting admission to apprenticeship would fall upon the universities and technical schools. It would be difficult to imagine either of them, in effect, closing their doors to intending students.

With this position in mind, I invited Dr. Kay and others qualified to express an opinion to give me their views on the matter for the benefit of THE CHEMICAL AGE readers. Dr. Kay, who is Senior Lecturer in Applied Organic Chemistry at Liverpool University, very kindly amplified his necessarily brief statement made at the meeting of the British Association of Chemists.

Graduates' Greatest Difficulty

Dr. Kay said one had only to note the ever-increasing unemployment among chemists generally, and the unusually slow absorption of the annual output of the universities and technical colleges, in order to realise that a serious situation had arisen for the majority of recent graduates who had taken up chemistry in anticipation of quickly settling down to reasonably safe and lucrative careers.

" The greatest difficulty young graduates have to contend with at any time is the entry into industry, as the majority of employers are naturally disinclined to engage untried recruits. This is a difficulty which is aggravated manyfold whenever the number of applicants, as at present, is out of all proportion to their chances of securing employment, and it is here that mutual help by the senior members of a professional association, such as the B.A.C., should come to be regarded as a point of honour.

" Looking back over the five hectic years which have marked the development of professional associations among the chemists and other scientific workers, it cannot be stated with certainty whether, in the absence of the present industrial depression, the normal march of events, including the unique opportunity for expansion created by the crippling of our German competitors, would have provided opportunities for all the qualified chemists now available."

A Drug on the Market

There were no data, continued Dr. Kay, on which to base an opinion, but in so far as the chemist was a marketable commodity with a narrow range of utility, he must share the fate of all surplus production, and become a drug on the market. With a more stable international situation positions might have been found abroad, in those countries where the chemical industry was in its infancy; one had only to recall the large numbers of German and Swiss chemists who before the war were able to settle in Russia, Italy, and North and South America. For the time being there was little hope in that direction.

" The universities are in no way to be blamed for the present *impasse*. Their function is exclusively the search after knowledge and the imparting of it to others. Taking a broad view, ultimate good can only result from ever-increasing activity on the part of the universities, and it is the ideal of the most advanced of these to provide opportunities for training in Letters and Science for the whole of the youth of the country. Judged by this standard, we are still a long way behind in this country, and yet there is this appalling difficulty of placing our graduates. Whatever action the universities may take it should be confined to raising the standard of their examinations which, by weeding out the inefficients, will bring about a certain alleviation. This policy, combined with the provision of a university education for the whole of those who are capable of profiting by it, would soon right the present overcrowding, for this country would then be able to crowd all her competitors out of existence.

" The step which I proposed at the annual meeting of the British Association of Chemists is but a beginning and, although it had the appearance of being an attempt to limit admission to the chemical profession after the manner of the craft trade unions, the real intention was to warn our schoolboys that a successful career as a chemist can only be built on the solid basis of a sound general education, by which is often implied the possession of the Matriculation certificate."

The Mentality of the Employer

Regarding the question of the greater industrial use of the professional chemist, Dr. Kay, in conclusion, said everything would depend on the mentality of the employer and the fiscal policy which regulated his industry. If manufacturers were content to follow, as in the past, the line of least resistance, which involved the relegation of the chemist to the more subordinate positions in the organisation, with seldom or never the opportunity of participating in the administrative or executive work of his organisation, then there was little hope of headway being made in that direction, and no amount of monopolistic protection would compensate for the loss to industry caused by the stifling of the initiative of its chemists and other technicians.

" On the other hand, with the employers themselves educated in the broad sense which has already been indicated, and actuated by the desire to produce for service as well as for profit, there would be little difficulty in securing the fullest possible use of the chemical talent now abundantly available, for, firstly, he would be able to appreciate the aspirations of his fellow-men, and, secondly, the apparently non-remunerative work of the pure research chemist would be assessed at its true value—a long-date investment, or, failing that, a service to the community."

Dr. Levinstein's Views

Dr. Herbert Levinstein, well-known as a leader of the British dyestuffs industry, and President of the British Association of Chemists, is in an unique position to discuss this question.

"The war not only led to a great expansion in the chemical industries of this country," said Dr. Levinstein, "but it also directly afforded employment to a great number of chemists in the manufacture of explosives. In consequence there was a marked shortage of trained chemists just prior to the Armistice. The emoluments paid and other causes naturally led to an increase in the number of chemical students of the universities after our forces were demobilised."

"The boom in students was greatly accentuated by the glamour which was thrown over the profession of chemistry by the achievements of British chemists during the war. To the great proportion of the population of these islands chemistry as a career was entirely a new thought, for the importance of chemistry and of trained chemists, so familiar in Germany and Switzerland and some other Continental countries, was quite a revelation to our own people. This feeling has largely died away, and there is no longer in the eyes of the general public the idea that the pursuit of chemistry is, in itself, a keystone to fame and fortune.

"It appears to me therefore, that the rush of students has not only diminished, but will continue to diminish until it reaches a level higher indeed than in 1914, but far below the numbers who have been qualifying during the last two or three years. It would not surprise me if this process were accelerated by the teaching authorities themselves, who have a habit, and a wise habit, of raising the standard of their examinations when the candidates are undesirably numerous.

"It is often overlooked that the outlet for chemists in industry is by no means confined to the chemical industries. A desire for a university education is not, and never has been, confined to those desirous of entering a profession. There is a large body of parents desirous that their sons should have the advantage of a university education prior to entering business. We see to-day in many unexpected quarters an equal desire on the part of business firms to engage young men who have had the benefit of a university education, irrespective of the particular branch studied. I am of the opinion that the study of chemistry, in conjunction with other branches of natural science, is not inferior as a mental training to the study of law or classics, and that the information acquired and the habits of mind engendered afford an infinitely better training for a business career than the study of the humanities. It is indeed desirable that Parliament, the Civil Service, and the educated community in general should contain a far greater proportion of men with a scientific training, and that a university education should not, in future, as has been the case in the past, mean in general a classical or legal education. The almost complete ignorance of even the elements of any branch of science among the governing classes is a national danger."

Better Times Coming

Dr. Levinstein said the chemists now being trained would be absorbed in some useful branch of the national life and, to a considerable extent, he thought, in the manner suggested, with the very desirable consequence of leavening classes hitherto ignorant of chemistry with a proportion of men who had been chemically trained.

"I do not believe that manufacturers are so ignorant as is commonly supposed, and that there are to-day many firms of consequence who could employ a chemist with advantage but have not the sense to do so. As regards those who take up chemistry as a career, we must remember that the number of chemists that can profitably be employed in the chemical industry depends on the magnitude of the business and on the profits. No chemical manufacturing firm can afford to spend more than a certain percentage of its turnover on the prosecution of research. The slump in trade has given a severe setback to the employment of chemists in research, but better times are coming, and we may hope that the opportunities, when they come, will be firmly grasped and lead to a permanent and continuous growth in our chemical industries and in their capacity to absorb chemical students."

"It is worth noting," remarked Dr. Levinstein in conclusion, "that the war increase in the chemical industry which led to the rush of chemical students has had a very marked effect on the amount of purely scientific research work carried on at our universities. I am at present inclined to think that even more remarkable and gratifying than the progress in the British chemical industry since 1914 has been the brilliant achievements in pure science, due, in part, to the larger numbers of research students available to our academic leaders."

A Debatable Question

Professor Arthur Lapworth, of the Chemistry Department, Manchester University, said he had no hesitation in stating that greater use than at present should be made throughout industry of the services of the professional chemist, or, as he should really be called, the graduate in chemistry.

"He would at least, I trust, be neither less useful nor less willing to work and learn than the man with no scientific training. It is probably well known that some firms are finding that a university training provides something which has a definite commercial value, altogether apart from the particular subject studied. A public discussion of these matters must inevitably lead, I think, to the consideration of such extremely difficult questions as that of the subjects taught in the schools and of the school certificate examinations. An almost equally difficult question is whether, in view of the limited number of tests in which a chemical training may be directly applied, a broad curriculum is not the best kind for the majority of science students in universities. I think it is very unlikely that you will find a consensus of opinion on either of these questions. In regard to the second, I would at least like to suggest that until a student has been brought at one point right up to the front line of science and has himself felt the nature of the difficulties beyond, he can but dimly realise what science really means, and must slavishly submit his judgment to the authority of his text-books.

"It is therefore a debatable question, after all, whether graduates in chemistry, providing that they have not been encouraged to sacrifice essentials for frills, are not at least as well qualified to spread the true gospel of science as others who may have seen more of other branches, but have not so thoroughly explored any of them."

Helping Industries to Compete Abroad

Mr. H. Heap, Lecturer in Chemistry at Manchester University, has expressed the following views:

"Before the war the average number of men passing the honours course in chemistry at Manchester University was between 20 and 30 a year, but for some time past the numbers had risen to between 100 and 200. During the war they were kept busy, but with the trade slump and the necessity for economy, industries have been unable to absorb them and they have either to turn elsewhere for jobs or remain on the unemployment list. This rush of students is still going on, and I am afraid there is great disappointment in store for these young men and women. Women form about 25 per cent. of the students, but they generally use the knowledge gained to fit them for the teaching profession, though some find employment in the fine chemical laboratories.

"It is a great pity that the nation should not be getting the value of all this training. Our industries need better brains to help them to compete with those of foreign nations in the markets of the world, and yet you have these hundreds of well-trained men and women unable to find work. There would be some hope for them if our manufacturers would depart from the old fashioned stereotyped methods and make more use of staff chemists in their works. Our big cotton and woollen manufacturers scarcely ever think of bringing in the chemist to help them to solve the technical problems that arise daily.

The Dyestuffs Industry's Example

"It is otherwise with the Germans, French and Americans. The skilled chemist has a part to play in the production of the finer classes of cotton goods, artificial silks, and other fabrics, and the establishment of works research departments might help the manufacturer in the building up of a lucrative business in which he cannot at present touch his foreign competitor. The only department in which this aspect of the value of the chemist is being realised is that of dyestuffs, where a real effort is being made in the production of new colours and new methods of applying them. There is no reason

however, why other branches of industry should not encourage the chemist to find out new things that would enable us to keep ahead of the march of science.

"At the moment I must confess it seems difficult to increase the field where chemists can be employed in ways which will prove remunerative to them, and a large proportion of the new B.Sc.'s will have to turn to other professions. It is true, of course, that a knowledge of chemistry does not bar young men or women from taking up some other profession in which their knowledge will be useful, such as medicine, the law, chemical engineering and the textile trades, but it is just as well for them to realise that the degree in chemistry does not necessarily open up at the present time a field in which a good livelihood may be obtained."

A Wrong Distribution

Dr. Mary Cunningham, of the Experimental Department of the Fine Cotton Spinners' and Doublers' Association, expressed the following very definite personal views :

"The notion of reducing the supply of chemists by restricting the size of university classes seems to me to show a complete misunderstanding of the object of university training, and I should be uncompromisingly opposed to any such procedure. Such a course is, I know, taken by the Law Society, but that is a professional examining body and not a university. Universities are not intended to give vocational training, and the course suggested would, I think, make graduation the equivalent of a trade union qualification for membership. The professor who would regulate the number of his students by the opportunities offered by industry is, to my thinking, no better informed than the cotton operatives who attempted to hold up invention by burning the new machinery, whilst the student whose only attraction to a scientific career is the lure of its possible emoluments might rest assured that he would never obtain even those emoluments.

"The alternative suggestion, to educate industry to appreciate the value of the trained chemist, seems, on the other hand, to be altogether commendable. There are certainly not too many chemists in industry, and there never will be until every part of every process is thoroughly understood, and every possible improvement has been tried. By all means, therefore, agitate for the substitution of scientific method for rule of thumb processes, and, even if only routine testing has to be done, spare no effort to see that it is undertaken by a qualified person. I have recently heard of considerable damage being done at a works because the same degree twaddle was supposed to indicate the same reactive strength in two solutions of different composition. It is no good to argue that the supply of chemists is in excess so long as such incidents occur. It is simply the distribution that is wrong."

Forcible Limitation Methods Not Wise

Mr. James R. Hannay, who is well known among Lancashire chemists, said no one who was acquainted with the present condition of things would deny that the immediate supply of men and women trained in chemistry far exceeded the immediate demand for chemists.

"It is, however, very doubtful whether any forcible measures to limit the output of chemical graduates would be a wise course, even from the point of view of the unemployed chemist. There is probably no science which will so universally serve its student well, no matter what career such student will ultimately follow. How long have chemists been bemoaning the lack of appreciation of their work displayed by the community in general, and by the commercial community in particular ?

"Presumably all the surplus chemists will find a career of some sort, and many of them will make good along lines which are not strictly those of the chemical profession. The presence of such men in industry ought ultimately to be for the good of the strictly professional chemist. I should certainly have all intending students of chemistry plainly warned of the probable difficulty of finding appointments as professional chemists at the close of their studies, but I feel equally persuaded that every student who, in spite of that warning, takes up the serious study of chemical science will ultimately help to dispel the dead weight of indifference which has long been acknowledged to be our heaviest handicap"

Disintegration of Coal by Acids

Better Quantitative Separation of Coal-Constituents

At the annual conference of the Institution of Mining Engineers held at Burlington House, London, on November 17, Dr. R. Lessing described certain experiments which he has been carrying out for the disintegration of coal by acids. In the course of an investigation on the mineral constituents of coal, he said, it was observed on warming samples of fusain with hydrochloric acid that a copious liberation of carbon dioxide took place, and a considerable portion of the mineral matter could be extracted. It was also found that the white partings in the sample of coal then examined (thick seam, Hamstead Colliery) contained from 40 to 45 per cent. of calcium carbonate. Advantage was taken of these observations to experiment in extracting from coal before incineration the portion soluble in acid. The surprising discovery was then made that coal so treated became brittle, and could easily be crushed between the fingers. The kind of acid seemed to be immaterial. Hydrochloric acid had been used successfully ; and carbon dioxide, while not acting as readily as the stronger acids, had still a marked disintegrating effect.

Applications of the Method

The first application of the treatment which suggested itself was a more complete quantitative separation of coal constituents than was possible by mechanical treatment. He had found that by treatment with acid the separation of fusain, durain, clarain, and vitrain from each other and from the inert companions of coal—ankerites, shale, and pyrites—was facilitated.

Possibly the most interesting mode of application of this process was its use in connection with mining operations. boreholes were drilled into the coal face to a certain depth one or two days in advance of the work, and sulphur dioxide was taken from a compressed gas cylinder and passed by means of acid-resisting tubes into the boreholes farthest advanced from the work. The gas was applied practically at an atmospheric pressure, when it was avidly absorbed by the coal. Sulphur dioxide was suggested on account of its extreme simplicity of application. The quantity necessary for the treatment of coal should, according to his experiments, not exceed one ton of sulphur dioxide per 1,000 tons of coal. On this basis the cost of manufacturing the reagent worked out at about 2¼d. per ton of coal. This work seemed to make worth while a comparison with explosives or with mechanical aids to the getting of coal. So far only two sets of experiments had been made underground—one at the Wathwood seam of Tinsley Park Colliery, where the result was somewhat inconclusive, and the other at Brereton Colliery, Cannock Chase, where the results were not yet available.

French Synthetic Ammonia Legislation

According to the Paris Correspondent of the *Financial News* Messrs. Auriol and Blum, Deputies, have tabled the text of an amendment to the law dealing with the manufacture of synthetic ammonia. The amendment has the object of reserving for the French nation the profits of the convention with the Badische Company. It suggests that all profits and invention processes shall be granted to a National Azote office, to be created to exploit new inventions, possessing civil and financial autonomy, and composed of two agricultural representatives, three engineering representatives, one from Chambers of Commerce, one from the Upper Railway Council, and three from Government administrations interested in such processes.

The Duke of York at Beckton

On Tuesday the Duke of York visited the Beckton Works of the Gas Light and Coke Co., and was received on arrival by Mr. D. Milne Watson. After visiting the gasworks, wharves, etc., the Duke went to the tarworks, where he was received by Mr. W. G. Adam, superintendent of the by-products works. Here 1,000 men are employed, and the Duke was interested to learn that twenty-six highly skilled research chemists were turning out various dyes of even finer quality than those for which Germany was once famous. During the war these works turned out huge quantities of T.N.T. and other explosives, besides sending 5,000,000 gallons of tar for use in France. The Duke devoted a good deal of attention to the processes of making naphtha and other coal tar products.

A British Editor's Impressions of the United States

How they are regarded in America

The following extracts are taken from the current issues of "Chemical and Metallurgical Engineering" and "The Journal of Industrial and Engineering Chemistry" just received, and relate to the visit of Mr. F. E. Hamer (representing Benn Brothers, Ltd.) to America and some impressions he contributed to the former journal. Mr. Hamer's CHEMICAL AGE *letters will be continued for some weeks, and will include descriptions of the Government scientific bureaux at Washington, the American Chemical Warfare station at Edgewood, the Du Pont headquarters at Wilmington, and other places of interest.*

Anglo-American Friendship and Unity

[*From "Chemical and Metallurgical Engineering."*]

FRESH impetus was given last month to the cause of Anglo American friendship and unity by the visit to the United States of a group of editors and publishers of English business and technical papers. They came as delegates to the annual meetings of the Associated Business Papers, Inc., and the National Conference of Business Paper Editors. In addition to participating in the sessions of these two organisations and exchanging views on publishing and editorial problems, they subsequently visited appropriate industrial centres and gathered impressions of business and economic conditions in this country. In the short time at their disposal they doubtless saw so much and in such rapid succession that their impressions resembled nothing so much as the striking but fleeting patterns of a kaleidoscope. But out of it all there crystallized certain general views in the minds of our visitors that must inevitably make for a better understanding in England of some American problems and conditions.

Prominent among the British visitors was F. E. Hamer, editor of THE CHEMICAL AGE, London, who, we are happy to say, was a most creditable representative of British chemical industry as well as its technical press. In the Chemists' Club, where he resided during his stay, he proved himself a delightful companion, and on several occasions demonstrated his capacity as a forceful and well-informed speaker.

The note of Anglo-American friendship that he sounded in his speech at the banquet of the Associated Business Papers and which was reflected also in messages that he brought from Lord Riddell, Earl Balfour, Lord Robert Cecil, Viscount Burnham, Sir Ernest Benn, Sir William Berry, and C. P. Scott, editor of the *Manchester Guardian*, gave additional evidence of the spirit of harmony prevailing among the leaders of thought in the two nations. Mr. Hamer's own impressions of the United States, penned briefly before he sailed and published elsewhere in this issue, will be read with no little gratification by chemists on both sides of the Atlantic.

A British Editors' Impressions

By Frederick E. Hamer

(*Editor*, THE CHEMICAL AGE, *London.*)

MY friend the editor of *Chemical and Metallurgical Engineering* has asked me to set down some impressions of American industrial conditions gained during a stay of four weeks in the United States as a delegate from the Weekly Newspaper Proprietors' Association of London to the Associated Business Papers, Inc., of America. It is inevitable that one's observations should be more or less superficial in such circumstances; at the same time, on the principle that the spectator sometimes sees most of the game, they may be worth recording.

Unity of Types and Similarity of Problems

My chief and most lasting impression is one of the essential unity between the British and American types of character and of the similarity between the industrial and economic conditions and problems in both countries. An Englishman visiting the other European countries—Germany, Italy, Switzerland, France or Belgium—invariably feels, however friendly the people may be, that he is in a foreign land. Here it is entirely different. Though this is my first visit to America, I at once sank into American conditions as into a comfortable armchair, and after a little over three weeks I feel as much at home in New York as I do in London. The language no doubt largely explains it; that in itself is a great and vital bond. But the likeness extends to our sympathies, our moral outlook and our general point of view. It is a great comfort to feel that the foundation principles of the founders of the American republic are still the basis of national thought and policy, and while that remains I feel that America cannot go far wrong. The future of the world rests with the English-speaking race, and if America beats England in its efforts for the welfare and progress of mankind we shall applaud and never envy your success.

Economically, both countries seem to be running on almost parallel lines. Taking the chemical industry as an example, the armistice was followed by an unprecedented boom, during which money was made with astonishing facility. One result was to bring into the chemical industry large numbers of people who knew nothing about chemicals. They bought up chemicals as they bought up anything that came along, because the scarcity was such that the speculator could sell anything he possessed at almost any price he cared to ask. That unhealthy condition disorganised trade, produced a false sense of prosperity and encouraged wild speculation. This stage ended with dramatic suddenness. In a moment trade came to a stop; the speculator was left with heavy stocks on hand, and the genuine trader found that instead of being able to sell anything he could sell nothing. The "slump" lasted about 18 months. It was the most severe in the history of British chemical industry. The large firms had to hold expensive organisations together. Many of them lost heavily, and I know of several instances where people had to sell their war bonds to pay income and other taxes. Now, fortunately, the depression has passed the lowest point, and a steady revival is in progress. That, in brief, is the history of chemical industry in England since the close of the war, and I gather that it is very much the history of it in America. Let us hope that for both there is a long period of prosperity ahead which will compensate for the losses and anxieties of the past.

Similarity of Conditions is General

But the similarity between English and American conditions appears to be general. The finest address I have heard in America was one by Mr. Barnes, the president of the United States Chamber of Commerce, reviewing generally the present condition of American industry. Passage after passage might have been taken bodily out of that address and if put into the mouth of our Chancellor of the Exchequer or President of the Board of Trade they would have described exactly the conditions of things in England. The primary need of settling down to work as the only real remedy, the damage caused to industry by strikes and the continual fear of strikes, the unwillingness of employers to embark on new enterprises until conditions have become reasonably stable, the irritation caused by meddlesome Government restrictions, and the demand of the trader for freedom to get on with his business—these were the things that Mr. Barnes emphasised, and they are exactly the things which British economists and business men like my chief, Sir Ernest Benn, have been continually emphasising at home.

Incidentally, I have been impressed with the thoughtful and responsible tone of the American public men I have met. If one judged of America solely from the jumpy headlines splashed all over the pages of the daily press, one might assume the American to be a particularly blatant and noisy person, having, like the seed which fell by the wayside, no depth of earth. The truth is the very opposite. Most of the speeches I have heard have been distinguished by moral earnestness and sincerity, by great analytical and penetrative thought, by a desire to go quietly to the root of the matter, and by a sense of exactitude in the use of words excelling even our own standards.

Important Rôle of the Technical Press

This brings me to the question of the business and technical press of America. I came over to America as a delegate from the trade and technical press of London to the business press of America. I brought with me messages of greeting from a number of distinguished journalists and public men, and nothing was more significant than their unanimity in emphasising the important part the business press of both countries must play in getting national business once more on to sound lines. Politics here seems to be even more of a game than with us. It is a game of personalities and parties, and the daily press is largely a reflection of these conditions. The result is that business is often the sport of politics, and economic problems are handled not on sound economic principles, but with a view to catching the popular vote. There is a growing feeling with us that the genuine commercial community does not bring its proper weight to bear on national policy, and if it is to do so it must be largely through the medium of the commercial and technical press. The great journals, for example, of the McGraw-Hill Co. understand the conditions of the various industries they serve in a way the daily journal cannot pretend to do. They can ascertain and explain the bearing of legislative changes, like the substitution of a tariff for the dye embargo, with direct authority derived from first-hand acquaintance with industrial conditions. They are in a position to serve industry in a twofold sense—first, by acting as the spokesmen of commercial interests, and second, by informing legislators and public officials on questions about which they must otherwise remain ill-instructed. The commercial and technical press of America is a magnificent instrument for the service of American industry.

Finds Americans Interested in British Affairs

One word more. It is pleasant to find how keen over here is the interest in British politics and trade. That does not support the theory that America has no interest in Europe. On the contrary, everywhere I go the inquiry has been, What is the future of Lloyd George? What is the present position of English political parties? What are England's economic and industrial problems and how is she going to face them? In spite of themselves Americans are interested in England and in Europe. Morally they cannot afford to live to themselves, even if that were commercially possible. America, as a land built on the principles of liberty and equal justice for all, has a moral duty to civilization which it cannot ignore without damage to its own moral fibre. I have formed the impression that the real wealth of America lies, not in its gold, but in its deep human sentiment and in its sense of the moral side of life. It is in these fundamentals that the essential unity of the English-speaking peoples comes out. We in England speak but little perhaps of Anglo-American unity, because with us it is so natural and inevitable that it does not need to be put into words. But it is good sometimes to give expression to what is in the hearts of both peoples, and I believe that the interchange of visits and ideas is equally good for both nations, and is good for the whole world. I shall carry back with me lasting memories of American hospitality and kindness, and the impression that underneath our external divergences there is a unity of mind and soul that must never be severed.

A Tribute from the Official Journal

Under the heading "A Visit from England" the *Journal of Industrial and Engineering Chemistry*, the official journal of the American Chemical Society, publishes the following:—

Mr. F. E. Hamer, editor of THE CHEMICAL AGE (London), spent three days in Washington visiting the various points of interest in and around the city. He seemed particularly interested in his visits to the Government laboratories, and expressed himself as well pleased with the progress being made in this country, both in Government and in industrial organisations. On Monday evening, October 16, Dr. Charles L. Parsons, Secretary of the Society, and Mr. H. E. How, editor of this journal, gave a dinner in his honour at the Cosmos Club. Those present to meet him were: W. D. Bigelow, Chief Chemist, National Canners Association; W. M. Clarke, Chief Chemist, Hygienic Laboratory, Public Health Service; F. G. Cottrell, Director, Fixed Nitrogen Laboratory; Amos A. Fries, Chief, Chemical Warfare Service; C. R. De Long, Chief, Chemical Division, Department of Commerce; F. S. Dickson, Director, Chemical Division, Treasury Department; W. F. Hillebrand, Chief Chemist, Bureau of Standards; W. F. Keohan, Washington Representative, Chemical Foundation; H. C. Parmelee, Editor, *Chemical and Metallurgical Engineering*; L. I. Shaw, Assistant Chief Chemist, Bureau of Mines; E. E. Slossom, Director, Science Service; E. W. Washburn, Editor, International Critical Tables, National Research Council.

Mr. Hamer came to this country primarily as the representative of Benn Brothers, Ltd., to attend the sessions of the Associated Business Papers, Inc., and the National Conference of Business Paper Editors. He takes back to England with him impressions and information concerning things chemical in America that he could not possibly have obtained in any other way, and he has left with us a much better understanding of the problems confronting our English cousins. Since our two countries are one in working for the progress of mankind, we believe that such interchange of ideas as has taken place during this visit of Mr. Hamer will go far toward cementing the good feeling existing between the two countries.

We are glad to have had this visit from him and hope it will be repeated in the near future.

British Industries Fair, 1923

Exhibitors in the Chemical Section

ARRANGEMENTS for the British Industries Fair, which opens on February 19 next, are proceeding apace and a very large proportion of the space available for stands has been booked. In this connection it is interesting to note that many of the chemical and other exhibitors are increasing the size of their stands.

We understand the firms exhibiting in the Chemical Section at the White City will include:—The Acme Chemical Co., Ltd., Tonbridge; Adams and Co., London; Ajax Aniline Dye Manufacturing Co., Ltd., London; Albright and Wilson, Ltd., Oldbury; Frederick Allen and Sons (Poplar), Ltd., London; Allen (Stafford) and Sons, Ltd., London; A. Boake Roberts and Co., Ltd., London; Boots Pure Drug Co., Ltd., Nottingham; J. C. Bottomley and Emerson, Ltd., Brighouse; Bowdler and Bickerdike, Church, near Accrington; Brinjes and Goodwin, Ltd., London; British Alizarine Co., Ltd., Manchester; British Chemical Plant Manufacturers' Association, London; British Drug Houses, Ltd., London; British Dyestuffs Corporation, Ltd., Manchester; Brown and Son, London; Burroughs, Wellcome and Co., London; Burt, Boulton and Haywood, Ltd., London; W. J. Bush and Co., Ltd., London; A. H. Cox and Co., Ltd., Brighton; Derby Crown Glass Co., Derby; Gas Light and Coke Co., London; William Gowlland (1916), Ltd., Croydon; Graesser-Monsanto Chemical Works, Ltd., Ruabon; Grays Dyes and Colours, Ltd., Grays, Essex; The Hadley Co., Surbiton; Hickson and Partners, Ltd., Bradford; J. G. Ingram and Son, Ltd., London; Johnson and Sons (Manufacturing Chemists), Ltd., London; B. Laporte, Ltd., Luton; Landore Zinc Works, Ltd., London; Marley Hill Chemical Co., Ltd., London; Mather and Platt, Ltd., Manchester; May and Baker, Ltd., London; Thos. Morson and Son, Ltd., London; Morton and Gregory, Ltd., London; L. Oertling, Ltd., London; Optical Manufacturers, Ltd., Evesham; Chas. Page and Co., Ltd., London; Roberts Patent Filter Machine Co., Bolton; J. L. Rose, London; Scottish Dyes, Ltd., Carlisle; Short and Mason, Ltd., London; South Metropolitan Gas Co., London; Spencer, Chapman and Messel, Ltd., London; Typke and King, Ltd., London; Thos. Tyrer and Co., Ltd., London; United Alkali Co., Ltd., Liverpool; Williams Brothers and Co., Hounslow; and Willmotts, Ltd., Evesham.

Exhibitors in other sections include (Engineering) Atlas Preservative Co., Ltd., London; British Oxygen Co., Ltd., Birmingham; Hockley Chemical Co., Ltd., Birmingham; Rapid Cobalt Co., Ltd.; Liverpool; (Soaps, etc.) Carsons, Sons, and Co., Ltd., Manchester; Day and Martin, Ltd., London; Dubarry et Cie, Hove; Fairy Dyes, Ltd., Glasgow; Haller Laboratories, Ltd., London; John Knight, Ltd., London; New Form Perfumery Co., Hull; United Laboratories and Chemical Co., London (Building and Hardware) Nobel Industries, Ltd., London; (Lighting and Heating) Ackroyd and Best, Ltd., Leeds; Kelvin, Bottomley and Baird, Ltd., Glasgow; National Benzole Co., Ltd., London; South Staffordshire Mond Gas Co., Tipton.

Safeguarding of Industries Act: Part I

Resumed hearing of the Oxalic Acid Complaint

The hearing of the complaint that oxalic acid has been improperly included in the Board of Trade List of dutiable substances was continued on Thursday, November 16, Friday, November 17, and Monday, November 20, when it was concluded, and the Referee intimated that he would give his decision in due course in the usual manner.

On November 16 Mr. E. J. Parry restated his views on the question of synthesis. It would not be possible, not knowing the constitution of the formate, to predict its constitution beforehand, because they would not know whether there had been merely a combination of the molecules or a junction. If it were correct to say that one of the characteristics of a synthesis was an increase in the carbon atoms, that did not apply to oxalic acid because they started with one carbon molecule and finished up with one. Although it was possible to predict that the synthesis would give oxalic acid, the process was not under that control which was laid down in the decision in the camphor case, and there was no experimental method of knowing exactly what was taking place at any stage. There were three possible reactions, but which one could not definitely be stated at any time, although it was possible to argue back, and that was, in fact, what was done. In short, it was impossible, from the reactions, without a prior knowledge of the constitution, to infer what the ultimate constitution would be.

The Referee: Suppose you have got a body the result of, say, a dozen different processes or steps, and suppose that ten of these were genuine building up steps where you can foresee everything, and the other two were not, are you going to say that your ultimate product is not a synthetic product?

Mr. Parry said in that case he should say it was a synthetic product.

The Referee: Then the mere fact that a small proportion of the steps are not genuine building up steps, or orderly steps, would not prevent the result being synthetic?

Mr. Parry said it would not, if in the main the process was synthetic. He could not agree that these conditions held good in this case because one of the steps in this case was a decomposition product at a high temperature. He agreed that caustic soda could be built up from its elements, but it was not done on a commercial scale. The word synthetic had never, to his knowledge, been applied to inorganic products.

The Referee said he did not follow the reasoning why the first step in the manufacture of oxalic acid was not synthetic.

Mr. Parry replied that his chief reason was that if they were going to say that a combination between caustic soda, which was an ordinary inorganic heavy chemical, with carbon monoxide, which was another inorganic heavy chemical, was a synthetic process, then they would be driven to the absurdity of saying that every inorganic heavy salt was a synthetic chemical. The word "synthetic" had only been applied to inorganic bodies in one or two special instances, such as synthetic ammonia, which had been so called to distinguish it from ammonia which had been made in another way for many years.

This closed the case for the complainants, and before calling his evidence on behalf of Messrs. Pritchard, Sir Arthur Colefax was asked by the Referee if he were going to contend that oxalic acid is a fine chemical.

Case for the Opponents.

Sir Arthur Colefax said he was not troubling himself much about that, but he did not wish to be misunderstood. He should contend, if need be, that oxalic acid is a fine chemical, and he should make it definitely part of his case, but his great submission was that oxalic acid was so demonstrably a synthetic organic chemical, beyond a shadow of a doubt, that he felt the strength of his position in that direction such that he need, without in any way departing from the view that it is a fine chemical, not trouble the Referee very much about it.

Dr. James Gordon Parker, F.I.C., consulting chemist, of 176, Tower Bridge Road, London, was then called, and was the only witness for Messrs. Pritchard. Having outlined the process of manufacture, he referred to text books and dictionaries in which the manufacture of oxalic acid was referred to as a synthesis, and quotations were read from *Ullmann's Encyclopædia of Technical Chemistry*, Perkin and Kipping's *Organic Chemistry*, Richter's *Organic Chemistry*, Roscoe and Schorlemmer's *Treatise on Chemistry* and other works. The fact that there was not conclusive evidence of constitution did not prevent a process being a synthesis, and he disagreed with the view that because there was decomposition at a high temperature of the process, the whole process could not be a synthesis. It was in no way the essence of a synthetic process that there should be no loss by destruction of some of the materials that were being used; indeed there were many syntheses in which this took place, and few in which there was not some destruction. On the question of whether oxalic acid is a fine chemical, Dr. Parker said that in the tanning trade the oxalic acid was used in small quantities, and very carefully, and was stored with the reagents. Then there was the point of whether a test of a fine chemical was the degree of care and skill required in manufacture, and he should certainly say that both care and a high degree of skilled supervision were necessary in the manufacture of oxalic acid. He, personally, classified synthetic organic chemicals as fine chemicals.

Deduction of Constitution

Under cross-examination by Mr. Swan, for the complainants, Dr. Parker said his definition of a synthetic organic chemical was generally that put forward by Mr. Parry, *viz.*, the building up of a compound from its elements, but he was not prepared to say that it must be possible to deduce its constitution. Counsel suggested that the reason why oxalic acid was referred to as synthetic in the text books and dictionaries which had been mentioned, was to distinguish a product made artificially from the natural product, but witness would not accept this. He insisted that synthesis in the case of oxalic acid began with the very first step in the process. At the same time, he did not believe that it was necessary that there should be an addition to the carbon atoms at every stage in the process, but only that there should be an increase as between the beginning and the end.

The hearing was then adjourned until November 17, when another short sitting was held.

Dr. L. A. Jordan, F.I.C., said he had had considerable experience in the preparation of organic compounds, and had specialised in the manufacture of synthetic organic compounds. He had definitely formed the opinion that oxalic acid was a fine chemical, for the reason that it was a clean white crystal of considerable purity, and it was not made in large quantities, its manufacture being essentially one in which skilled supervision was required. Incidentally, he could tell instinctively what a fine chemical was. He had no experience of the manufacture of oxalic acid by the process which had been described, but he had been interested in various processes, and his view was that it is undoubtedly a synthetic organic chemical. Oxalic acid was actually built up from its elements by a series of operations which were individually and collectively synthetic operations in the purest sense, *viz.*, the absorption of carbon monoxide by caustic soda to form formate, and the subsequent formation of oxalate, with progressive increases in molecular weight, which was a condition regarded as necessary to synthesis in the sense of building up. At the same time, he did not admit that it was absolutely necessary to increase the molecular weight in order to get a true synthesis. An increase in the number of carbon atoms was generally regarded as evidence of synthesis, but it was not, in his opinion, absolutely necessary. There was, however, an increase in the number of carbon atoms in the case of oxalic acid. If one knew the beginning product and the end product, as was the case here, he did not understand why it should not be called a synthesis.

Defining Synthesis

There was a discussion between the Referee, counsel and witness as to the definition of a synthetic organic chemical in the camphor case, and Dr. Jordan said that there were instances which rather indicated that that definition was not

wide enough. If they stuck to the words "differently constituted molecules," a large number of substances would be taken out of the definition and could not be regarded as synthetic, which at present were accepted as such.

The REFEREE said he had always understood the definition to mean that although originally synthesis had been confined to the building up of bodies which could be built up directly from their elements, it had become rather wider, and now included the building up of certain compounds although they could not be traced right back to their elements, and that as long as they took differently constituted elements which were not synthetic in themselves, and proceeded from them to build up, the result was a synthetic chemical. He did not think it mattered in this particular case, however.

In cross-examination, Dr. Jordan said he had been interested in various processes for the manufacture of oxalic acid, and was now manager of a syndicate which intended to work an entirely new process in this country early in the new year.

Several questions were put by the Referee on the matter of inferring the nature of the end product, and Dr. Jordan instanced the mauve dye of Perkin, which was obtained when he was expecting to get quinine from quinoline. Finally, he suggested that the true definition of a synthetic organic chemical was a chemical which was the result of a chemical reaction, although he admitted that this view of synthesis was a very wide one indeed, after the Referee had pointed out that nobody else had suggested such a wide definition.

Addressing the Referee on behalf of Messrs. Pritchard, Sir Arthur Colefax said that if the definition in the camphor case was to be construed in the manner that Mr. Swan was attempting to construe it, it clearly could not stand as an accurate definition, because there would be many cases which were indisputably syntheses which would not come in. Speaking of the case generally, he said there were some quite clear fallacies underlying the line adopted by Mr. Swan. In the first place it had not been suggested from his side that at every step of the synthesis there must be an addition of carbon compounds. There was a linking together of carbon to carbon, and it might be continuously progressive, but it had not been suggested by him that that must take place at every step in order to constitute a synthesis.

In the case of urea, for instance, there was no transformation of carbon atoms, but merely a change in the grouping of the atoms; the molecular weight remained the same. Another fallacy was that it must be possible to infer, from the transformation, the constitution of the formate, and that he contended was entirely wrong. High temperature, too, did not touch the question of whether it was a synthesis or not, because acetylene was synthesised at high temperature in the electric arc. As to the point that if oxalic acid is not a fine chemical it cannot be a synthetic chemical, it might very well be that the framers of this Act were not talking about trade terms at all, and it might be that they thought all synthetic organic chemicals were fine chemicals. Some chemists took the view that all chemicals were fine chemicals except the acids, but another view was that all synthetic organic chemicals were fine chemicals. If they construed the Act in a manner which was never in the contemplation of those who framed it, they got a different result, and he submitted that it was too late for Mr. Swan to put forward the suggestion he had made as to the true meaning of the words "All other fine chemicals," and that it should be held that a substance cannot be a synthetic organic chemical unless it be a fine chemical. The term "synthetic organic chemical" had a meaning quite apart from the consideration of the question whether it was fine or heavy. Many chemists might have a perfectly definite view of what a synthetic organic chemical is, and very different views of a fine chemical. As regards the manufacture of oxalic acid being a synthetic process, the Referee had been shown books in which it was definitely referred to as a synthesis, and nothing to the contrary had come from the other side. He based his case on oxalic acid being a synthetic organic chemical, principally, and as regards it being a fine chemical, they had had the trade evidence. Mr. Butler was a very important witness for the other side, as he probably had more to do with oxalic acid than any of the other witnesses; and yet one of the catalogues which had been put in, as late as June, 1922, contained oxalic acid in a list of fine chemicals and pharmaceutical products. He agreed that the bulk of the trade evidence went to show that it appeared in the catalogues as a heavy chemical, for what it was worth; but, on the other hand, the trade had not troubled much to consider what it was. He himself had put in two chemists who regarded it as a fine chemical. If the Referee was convinced by the scientific evidence, the trade evidence need not deter him from deciding that oxalic acid is a fine chemical. Personally, he thought the weight of the evidence was in favour of it being a fine chemical; his case did not rest on that but, as he had already mentioned, he placed the fact of oxalic acid being a synthetic organic chemical first.

Board of Trade's View

Mr. Whitehead then addressed the Referee on behalf of the Board of Trade, and dwelt mainly upon the interpretation which Mr. Swan had desired to give the wording of the Schedule to the Act which, he said, was quite contrary to the spirit of the interpretation of a commercial Act of Parliament, and also wrong in law, and he failed to see that any other conclusion could be come to than that oxalic acid is a synthetic organic chemical. He briefly reviewed what had been said as to the synthesis, and urged that there could be very little synthesis at all if it was essential to infer the precise nature of the end product.

Use as Analytical Reagent

When the proceedings opened on Monday, the Referee asked Mr. Cripps (for Messrs. Pritchard), and Mr. Ronca (of the Board of Trade) to try to find some adjective which would distinguish oxalic acid made by the formate process from that made by the sawdust process. It had been agreed that the sawdust process was not synthetic, and that the product was not a fine chemical, so that if oxalic acid made by the formate process were to go into the list it must be distinguished from the other.

The Referee's views were also indicated with regard to the point as to the use of oxalic acid as an analytical reagent, for he asked Mr. Swan not to trouble about that in his remarks. He asked him to deal, however, with how oxalic acid had got its trade description as a heavy chemical, because it might well be that it had got that description before the formate method was discovered. If a new method were discovered of making a chemical, previously admitted to be heavy, which would bring it into the realm of fine chemicals, he would like to know how it would then be treated. He was satisfied on trade evidence that oxalic acid had not been characterised as fine, but the explanation might be found in the history of its manufacture.

The Formate Process

Mr. SWAN, addressing the Referee, said that the formate process was on the market in 1897, and went on to review the trade evidence, in order to show that trade catalogues and journals had treated oxalic acid as a heavy chemical during the large number of years when the predominating oxalic acid on the market was that made by the formate process. He laid stress on the fact that, under cross-examination by Sir Arthur Colefax, Mr. Butler, of Messrs. R. W. Greeff and Co., had stated that he had bought German oxalic acid made by the formate process. Yet Mr. Butler's evidence was that, without qualification, it was treated as a heavy chemical by the trade. There was also the other trade evidence, and that given by Mr. Parry, all of which must carry great weight. Dealing with the opponents' evidence, Mr. Swan said that Dr. Parker, when asked whether oxalic acid was a fine or a heavy chemical, had said that it was not a fine chemical. Mr. Swan submitted that there was no justification in the evidence for thinking that it only related to the sawdust oxalic acid, and did not relate to the product which was the predominating product for the last 15 or 20 years. So far as he could see there was no other reason to support that view other than that the sawdust oxalic acid was the original form in which the acid was put on the market. On the other hand, there was uncontested fact that the formate oxalic acid had been on the market for many years and had invariably been treated by the trade as a heavy chemical. This Act was not an Act of Parliament for re-christening chemicals, but for classifying chemicals according to their *status quo*.

Continuing, Mr. Swan said Sir Arthur Colefax had said that the words in brackets in the schedule, after "All synthetic organic chemicals," included some heavy chemicals, and from that he had asked the Referee to infer that the words "All synthetic organic chemicals," but for the words in brackets,

would have included heavy chemicals. His (Mr. Swan's) answer was that those chemicals included in brackets were dyes, and the object was to take those substances out of this Act, because they were dealt with in another Act, and he submitted that it would be wrong to draw any other inference from those words. Those brackets effected the exclusion of the only type of synthetic organic chemicals which seemed to include heavy chemicals.

Analogous Expressions

The REFEREE said that would still need the brackets if the expression in the schedule were "all synthetic organic *fine* chemicals." Illustrations of analogous expressions were then given, and Mr. Swan said these expressions must be construed in a manner consistent with common sense; in the case of an expression capable of two interpretations, he impressed upon the Referee the necessity of adopting the one which was consistent with common usage and common acceptance of the words.

The REFEREE said he did not think he was with Mr. Swan on this point, but it was one on which, if the complainants desired it, he would be willing to state a case for the Courts.

Mr. SWAN replied that it might be well to state a case on that point, but he could not say at the moment whether his clients desired it. Continuing, he said his submission was that all synthetic organic chemicals were fine chemicals, and he referred to an advertisement of British Drug Houses, Ltd., which dealt with the co-relation between synthetic organic chemicals and fine chemicals. But, even if he were wrong in his contention, and the term "synthetic organic chemicals" was not to be so limited, it would be a unique instance of a heavy chemical coming within that definition. Dealing with the question of synthesis, he believed he had a stronger case in that connection than in connection with construction. There was no dispute as to the facts on the "synthetic" part of the case; the only difficulty arose in applying the facts and seeing what inferences were to be drawn. He took his stand absolutely upon the definition given in the camphor case. If the reaction were understood with certainty there was no doubt that it would be synthetic, and they would then be able to develop it.

Continuing, Mr. Swan said that Mr. Parry had referred to recent literature, which showed the reaction to be as obscure as it was 40 years ago. If the Referee held that a reaction which was not completely understood, as in the case of the transition from formate to oxalate, was a synthetic operation, and that the product was a synthetic product, he ventured to say that it was in antagonism to the definition and in opposition to the camphor decision. He agreed that if they knew what was going on, he could not longer say that it was not a synthesis.

The REFEREE asked whether, supposing there were one step in a chain of operations which was not completely understood, and the others were, would Mr. Swan say that the resultant product was not a synthetic organic chemical.

Mr. SWAN said he would not like to say that himself. If there were a large balance of syntheses in the chain he would hesitate. But in this case there were only two steps, the major step being wrapped in obscurity.

Course of the Reaction

The REFEREE said it had struck him very forcibly that no one had challenged the contention that benzene was universally accepted as a synthetic chemical.

Mr. SWAN said it was described in text books as a synthesis in the sense that it was the artificial production of natural benzene, and not in the sense used in the Act.

The REFEREE then examined the words in the definition, and suggested that when Mr. Swan said that the result of the reaction in the case of benzene could not be followed, he meant the "course" of the reaction. The word "result" was rather in antithesis to the word "course." He supposed, however, that those who had considered this in the previous case had chosen their words carefully. In the course of further discussion, he remarked that it might have been wiser to have appointed a chemist for this Act, because to a person who was not a chemist it seemed rather strong to say that they were going to exclude from synthetic chemicals one which was going through a great heat so that they did not know what was going on, but from the result of which they could make a pretty shrewd guess as to what had happened. The case had boiled down to one which was fairly easily stated, but he was going to read the evidence in the camphor case carefully, because there was no doubt a great deal there which would help him. He would also go through the evidence in this case again.

Mr. SWAN pointed out that this reaction did not fall within the first half of the definition, namely, a building up of carbon compounds, either from their constituent elements or from groups of differently constituted molecules by orderly steps.

Referee's Summing Up

The REFEREE, summing the matter up, said that, broadly, the first part of the process was so haphazard that they could not reasonably call it building up. On the other hand, what degree of orderliness must there be about it? It appeared to him that it could not be that unless they could find that perfect orderliness at every step it could not be synthetic; he should imagine that it was a question of degree in each case. Therefore, consideration had to be given to what degree of orderliness would bring it within the definition.

Finally, Mr. Swan asked the Referee to bear in mind, as a consideration bearing on the question of whether the substance was to be treated as a synthetic organic chemical or not, the evidence that the trade had never called it synthetic.

The Referee's decision will be given in due course.

The Sodium Phosphate Complaint

The hearing of the complaint that "sodium phosphate mono-R. sodium phosphate, di- and sodium phosphate tri-" have been improperly included in the list of articles chargeable with duty under Part I of the Safeguarding of Industries Act, has been fixed for to-day (Saturday).

Faraday's Society's Meeting

Theory of Intramolecular Ionisation

AT a meeting of the Faraday Society on Monday, Professor T. M. Lowry, in a paper on "Intramolecular Ionisation," showed the application of the theory in organic chemistry, and also gave a brief description of a number of applications in inorganic chemistry. Internal ionisation was postulated in a number of compounds where the changes on the nuclei are not balanced by the enveloping electrons. The author pointed out that stability in oxy-acids depends on the presence of a positive charge on the central atom of the ion. This also increased the strength of the acid. A maximum of stability and of strength was reached in acids containing four atoms of oxygen round the central atom of the ion

Hydrogen Ion Concentration of Natural Waters

In a paper by Dr. W. R. G. Atkins on "The Hydrogen Ion Concentration of Natural Waters and some Etching Reagents in Relation to Action on Metals," it was shown that natural waters are usually between pH6 and pH8·3, unless when rendered more acid by oxidation of sulphur from pyrites or by metallic salts. Bog pools might be as acid as pH5. Photosynthesis increased the pH value. The hydrogen ion concentrations produced by certain salts were recorded, and the limits for initial and complete precipitation of a few hydroxides were given with approximate accuracy. The author stated that ferrous salts in solution become more acid on standing, with precipitation of ferric hydroxide. The latter was completely precipitated before ferrous hydroxide was, as the solution was made progressively more alkaline. These facts were considered in relation to the rusting of iron, and it was shown that even at pH7·1 the precipitation of ferrous hydroxide was incomplete. Hence a trace of acid sufficed to attack iron, and the hydroxide produced through hydrolysis was oxidised and precipitated. The hydrolysis equilibrium was thereby upset and acid was regenerated. Attention was drawn to the possible utility of buffer mixtures and of acids or relatively low hydrogen ion concentrating as etching agents.

Viscosity Changes

Dealing with "Viscosity Changes" associated with the gel to sol transition, Mr. E. W. J. Mardles stated that the viscosity-time changes associated with the gel to sol transition have been measured at various temperatures and with different concentration systems of cellulose acetate in benzyl alcohol. The viscosity at first rapidly diminished, the rate of change becoming smaller until a constant value was obtained.

British Sulphate of Ammonia Federation

Second Annual Report and Meeting

In their second annual report, the Council and Executive Committee of the British Sulphate of Ammonia Federation, Limited, state that the year ended May 31 last was the twenty-fifth year of propaganda work undertaken successively by the Sulphate of Ammonia Committee, the Association and the Federation.

In comparison with the previous year, the nitrogen market was free from violent fluctuations in supply and price; and the credit for the improvement in the general position was undoubtedly due to sulphate of ammonia makers here and in America, who decided to meet buyers' wishes in regard to prices during the summer months, and were thus able to liquidate their stocks. At the end of May, 1921, the combined unsold, and apparently unsaleable, stocks of British, American and foreign sulphate of ammonia could not have been far short of 200,000 tons, the bulk of which had been produced during a period of very high costs of production. Under normal conditions, and in view of the decrease in current British output due to the coal stoppage, it might have been possible to carry the stocks forward to the following consuming season and sell them at about their cost of production. But the risks involved in attempting to carry out such a policy appeared to the Executive Committee far to outweigh the possible advantages. Apart from the uncertainty as to whether America would be willing or able to act on similar lines, the danger of a collapse in nitrate of soda prices was only too apparent. On the one hand the Chilean Government, beset with labour difficulties, was pressing the Nitrate Producers' Association to make fresh shipments, and on the other there were unsold stocks of 1½ million tons of nitrate in various parts of the world.

Disposal of Surplus Stocks

To continue to stock sulphate of ammonia with such a super-abundant supply of nitrate available would have been to court disaster. The Executive Committee therefore decided to sell off the stocks. Home prices were reduced to £13 3s. per ton, and after some weeks of negotiation, a level of price for export was reached at which the Japanese importers could compete with the sellers of local forms of nitrogen, and Java, France and Spain also began to buy, and in a few months the whole of the stock was liquidated. America had pursued a similar policy, and in the meantime a definite agreement had been arrived at between the Chilean Government, the Nitrate Producers' Association and the "Pool" of European nitrate holders, by which a portion of the losses incurred by the "Pool" was to be made good. Prices for nitrate were reduced, and as sulphate of ammonia prices exhibited a steadily rising tendency, overseas buyers began to feel that the tide had turned.

British agricultural merchants were slower to appreciate the position. They were intimidated by the farmers' complaints and the volume of their unpaid bills. They were fearful of the result of the unofficial advice which was being given to farmers by some of the farmers' societies to withhold their orders in the hope of bringing about a reduction in prices. However successful this advice may have been in the case of other fertilisers, it was bound to fail with sulphate and nitrate, because prices had been reduced below cost of production or acquisition, and stocks were firmly held. Agricultural merchants therefore predicted a considerable falling off in the home demand, some of them foreshadowing a reduction of 50 per cent. The Committee budgeted for a decrease of 20 per cent. on the previous year's figures, and this turned out a correct forecast, although the total deliveries would have been smaller if the season had not been cold and late.

Home deliveries showed a very marked falling off during the months August to December, 1921, in spite of the very low prices fixed, and the Committee therefore expected that the farmers would place their orders freely for January. They did not do so, however, and at that time it seemed possible that the home merchants' fears were going to prove justified. Added to this came the disagreeable news from Spain that American brokers were offering large quantities freely for prompt and spring delivery at prices lower than ours. The Committee therefore decided to accept export orders for a moderate quantity for January-March delivery, so as to ensure outlet for a portion of the future output. The American selling in Spain was due to the same causes which prompted the Federation's sales for export. The American fertiliser companies had their safes full of farmers' bills, some two years old, and their bins full of fertilisers. Early in February corn prices had dropped to such a level that farmers in the West and Middle West were burning corn as fuel. By the middle of March a complete change had taken place; corn prices rose, the banks helped to melt the frozen credit, and the whole of the available supply of nitrogen in the United States was bought up to the end of April for home consumption.

A Difficult Situation

In the meantime a difficult situation arose in Great Britain. Farmers had been encouraged in their inclination to hold off till the last moment by a small reduction in nitrate prices made early in February. But they had now received their subsidies from the Government, and finally decided to place their orders for sulphate of ammonia towards the end of February and early in March. The weather was fine and the Federation was overwhelmed with orders for prompt delivery. It was inevitable that many farmers should be disappointed: they expected prompt delivery of a total quantity equal to at least three months' production, and when they found that the Federation had export contracts to fulfil, they were not slow to complain to the Ministry of Agriculture and demand prohibition of export. The Committee was able to convince the Ministry that the farmers had only themselves to thank for the temporary shortage, and took energetic steps to deliver every ton available, even postponing delivery of some of the export contracts. The Federation was able to cope fully with the home demand by the end of April. This demand continued uninterruptedly throughout May, and unusually large orders were received during the early part of June.

Under these circumstances, it would have been easy for the Committee to raise the home price during March and April. But it was felt that it would be unfair and impolitic to attempt to exploit a temporary scarcity to the farmers' detriment, and also that the price of £17 3s. per ton for neutral quality which had been fixed, although lower than the parity of the nitrate price, was quite high enough in view of the financial difficulties of many farmers. The propaganda staff of the Federation received many encouraging proofs of the popularity of sulphate of ammonia among British farmers during this somewhat trying period. Many farmers said they would prefer to wait till the Federation could deliver rather than buy nitrate.

The conditions and events set out in this retrospect were not of a character to encourage hopes of obtaining good prices, and in point of fact the average price for the year was about 40 per cent. lower than for 1920-21. While the selling price at the beginning of the season was probably considerably below cost of production at that time, there was a continuous fall in wages, fuel and raw material throughout the period. On the average, therefore, the selling price has probably left a bare margin on cost of production; but this, of course, means that at many of the smaller works production has either been carried on at a loss or ceased altogether.

A large reduction in the price of sulphuric acid has taken place. In June, 1920, the price was £5 to £7 per ton, whereas in May, 1922, supplies were obtainable in some districts at about £3 per ton. The last-named price is still about 100 per cent. over the pre-war price, and will have to be greatly reduced if sulphate of ammonia makers are to adjust their cost of production to the level of the selling price for nitrogen, which may be expected in the not very distant future.

If the financial return for the year has been meagre, the Federation has, at any rate, prevented that total collapse in prices which took place in so many other commodities. The prospect for the coming season is encouraging. Nitrate of soda stocks have been reduced, and sulphate of ammonia stocks are non-existent, so that it seems reasonable to hope for a considerable advance on the average price for 1921-22. While there will certainly be an increase in output in Great Britain, due to the improving trade conditions, the American

coal and railway strikes will reduce the quantity available for export from the United States, and it seems clear that Germany is unlikely to be able to produce more nitrogen than she can consume. Indeed, owing to the great explosion at Oppau in October, 1921, which entailed a loss of three months' production, and to subsequent difficulties of transport, Germany's supply of nitrogen for 1921-22 was not equal to her home demand, and about 20,000 tons of nitrate of soda were imported. Germany could, under present conditions, probably consume annually about 340,000 tons of pure nitrogen, equal to about 1,700,000 tons sulphate of ammonia; her production last season has been stated as 290,000 tons of pure nitrogen, and it is estimated that she will produce 320,000 tons during the coming season. The Federation therefore feel that they can look forward to the coming season with considerable confidence. At the same time a word of warning is given as to future years. In spite of the great success which has attended German and Norwegian efforts to produce synthetic nitrogen, other countries are only beginning to attack the problem. They will in time succeed in solving it, and as synthetic plants can apparently only be profitably worked on a very large scale, it is probable that in the course of the next ten years production will at times outrun consumption. Moreover, if the effect of the repayment of British war debt to America is to cause a heavy fall in American wheat prices, Germany may become an exporter of nitrogen on a large scale again. Probably the mere possibility of synthetic output on a large scale will tend to bring nitrogen prices down to a lower level.

Technical Problems

The Federation has shown what efficient commercial organisation can do in a time of crisis, but commercial organisation, however good, cannot be a permanent substitute for technical efficiency in methods of production. Cost of production will remain the ultimate and decisive factor in international competition. Much can be done by conferences such as the Rotterdam meeting, but it will be the makers with the lowest cost of production who will attend and prevail at such conferences in the future. The Committee therefore hopes that members will pay greatly increased attention to the question of reducing cost.

The Federation Council suggests consideration of the problems of increasing the yield of ammonia per ton of coal carbonised, and of better control of and economy in the use of steam in the sulphate plant as fruitful lines for inquiry. Special attention is drawn to the research work on destruction of ammonia in the retort which is being carried out by Professor Cobb at Leeds, and to the helpful work and advice of the Chief Inspector under the Alkali Act, and his assistants, in kindred matters. The consumption of lime in the sulphate plant should be watched and loss of ammonia through waste liquor carefully guarded against.

As in previous years, the Federation has been able to effect considerable economy in delivery charges by chartering steamers for export to destinations to which liner rates were high. The Council applied the same principle in the case of shipments to Ireland, and was able to ship from English East Coast ports to North of Scotland ports at lower through freights than the railway rate from works in South Scotland.

There has been a marked increase in the output of neutral quality of sulphate; at the time of writing over 50 per cent. of the production is of neutral quality.

The Federation numbered, on June 1, 1922, 396 members —an increase of 6 over 1920-21—whose annual production represents slightly over 90 per cent. of the total annual production in the United Kingdom.

The Annual Meeting

Speaking at the second annual meeting, held at 30, Grosvenor Gardens, London, on November 16, Mr. D. Milne Watson (the chairman), after referring to the Federation's work in popularising sulphate of ammonia, particularly at a time when other fertilisers were hard to sell, said that their average price last year, from the point of view of the producer, who had to pay high wages, costly renewals, unduly heavy railway charges, dear stores, and last, but not least, more than 100 per cent. over pre-war price for sulphuric acid—was frankly disappointing.

High Cost of Sulphuric Acid

Dealing with the question of sulphuric acid, Mr. Watson said the present price was still about 100 per cent. over the pre-war price and would have to be greatly reduced if sulphate of ammonia makers were to adjust their cost of production to the level of the selling price for nitrogen, which might be expected in the not very distant future.

Referring to the report of a recent speech of the chairman of the National Sulphuric Acid Association, the chairman said he found in it a reference to a crisis which took place in the spent oxide market a short time ago. That crisis was compared to the recent crisis in the Near East, and as producers of oxide the sulphate manufacturers were apparently assigned the all-too-flattering rôle of the Turk. He personally was under the impression that, for the past seven years or so, spent oxide producers and sulphate of ammonia makers had rather been playing Armenian to the acid-makers' Turk. However that might be, he hoped the wise counsels of those members of the Sulphuric Acid Association, who were now urging a further reduction of prices, would prevail. He wished to make it clear to the members of that Association that the sulphate of ammonia producers were far from satisfied at the present position, and that they intended to make the most strenuous efforts to get their acid at a much cheaper price than they were now having to pay.

Synthetic Ammonia and Nitrates

Dealing with the membership of the Federation, Mr. Milne Watson recalled the fact that members were entitled to give notice to terminate their membership on May 31 last. They lost members with a capacity of 3,556 tons per annum, but they had retained members with a capacity of about 300,000 tons per annum, representing over 90 per cent. of British production. A further and most significant piece of news was that Synthetic Ammonia and Nitrates, Ltd., who might fairly be called the successful pioneers in the production of synthetic ammonia in Great Britain, had decided to join the Federation. They had been running a small plant, but working on a fully commercial scale, for over a year now, and their great plant at Billingham was confidently expected to reach the producing stage within the next six months or so. Their production would be on a relatively small scale to start with, but if conditions were favourable it would greatly increase hereafter. He thought it was a great triumph for the idea underlying the Federation that such an enormously important new producer who in material resources, quantity and quality of output, and in geographical situation was in a better position than any other individual maker in the kingdom to meet competition single-handed, should have decided to take this step at so early a stage in its operations.

Dealing with the possibility of a large increase in the consumption of nitrogen, the chairman pointed out that Germany is consuming purely for agricultural purposes about 320,000 tons of pure nitrogen per annum, and this works out at no less than 10.3 lb. per acre, comparing with 2.01 lb. per acre used in France, and about 4½ lb. per acre used in the United Kingdom. This seemed to point to the fact that the figure of 12 lb. of pure nitrogen per acre which they had indicated as the attainable consumption of nitrogen was well within the bounds of possibility. France, Germany and the United Kingdom were at present using about 404,300 tons of nitrogen per annum. On the basis of 12 lb. per acre of arable land, they could and should be using about 755,000 tons per annum.

Competition for Chilean Nitrate

In regard to the importance of reducing costs to a minimum, Mr. Milne Watson said they had not only to face competition from producers of synthetic nitrogen, but they might also be quite sure that, as the production of sulphate of ammonia grew, the Chilean nitrate companies would make determined efforts to reduce their costs by getting a higher yield. At present he thought he was correct in saying that they were only able to extract about 50 per cent. of the nitrate contained in the deposits. They had been expecting for some time to hear that an improved extractor or filter had been invented, and the technical Press had recently referred to a new method of extraction (*See* THE CHEMICAL AGE, Vol. VII, p. 675), which would give a far higher yield than their present method. Their present cost was, roughly, £8 10s. per ton, and that included the royalty of £2 10s. per ton levied by the Chilean Government.

The Dyeing of Acetyl Silk

Results of Investigations with the "Ionamine" Class of Dyestuffs

A MEETING of the Manchester Section of the Society of Dyers and Colourists was held in the Chemical Theatre of the Manchester University on November 17, Mr. William Marshall, F.I.C., presiding. A paper entitled "Ionamines: A New Class of Dyestuffs for Acetate Silk," by Professor Arthur G. Green, F.R.S., and Kenneth H. Saunders, B.Sc., was read by Professor Green.

Professor Green began by making a few remarks upon artificial silks in general, as there was a certain amount of confusion with regard to what they were. Natural silk was a nitrogenous albuminous substance not far removed from gelatin. On the other hand, artificial silks consisted of cellulose, or derivatives of cellulose—*i.e.*, they did not contain nitrogen. They were, therefore, entirely different chemically from natural silk, and the term "artificial silk" was a misnomer; they ought to be called silk substitutes, although they might approach very closely to silk in physical appearance. The first artificial silk was produced by Count Chardonnet, and was obtained by pressing a solution of nitrated cellulose through very fine orifices. All artificial silks were obtained in a manner similar to this, by pressing a solution, or a viscose solution of a cellulose derivative through very fine orifices. The fine filament which was then produced was usually further stretched, and a number of them were brought together to make a thread.

The varieties of artificial silk with which we were best acquainted in this country were the viscose silk which was invented by Cross and Bevan, and the acetate or acetyl cellulose silk which had been introduced more recently. Dealing with the latter variety, the lecturer said this industry arose to some extent out of the war, because acetyl cellulose was manufactured during the war for making varnish for aeroplanes, and upon the cessation of hostilities means had to be found for using the big plants which had been put down.

Qualities of Acetyl Silk

Acetyl silk, or acetate silk, presented—by virtue of its water-repellent qualities and the fineness of filament to which it could be spun—great interest. It approached more nearly to natural silk than any other variety of artificial silk. The filament could be spun out to such extreme tenuity that it was finer than the natural silk spun by the silkworm. Unfortunately, these good qualities had hitherto been discounted by the difficulties in dyeing the fibre, for it exhibited little or no affinity for direct cotton colours or for the majority of acid dyestuffs. The beauty of the material and the fascinating nature of the technical problem had led, during the past few years, to many investigations directed to overcoming these difficulties, and considerable progress had been made.

When the authors took up the investigation of this problem it was known that acetate silk exerted a considerable affinity for amido basic dyestuffs, more especially in the presence of zinc chloride or common salt, etc. It had been ascertained by Mr. W. Harrison, of Messrs. Burgess, Ledward and Co., who had done a lot of work in this connection, and by Mr. G. H. Ellis, of the British Cellulose Co., that a series of fast shades could be obtained by dyeing in an amidoazo bath. While, therefore, it was possible to dye a considerable range of individual shades by means of carefully selected dyestuffs, there did not exist any single class of dyestuffs having a special and selective affinity for this material, like the direct cotton colours had for cotton. The position was, in fact, rather similar to that existing with regard to cotton before the introduction of the direct cotton colours.

The dyestuffs which were employed were selected from a number of different groups—basic groups, mordant groups, etc. The authors had been led to attempt the preparation of a special class of dyestuffs for acetate silk owing to the substances they had been engaged upon containing oxy-alkyl radicles attached to nitrogen. It seemed possible there might be an enhanced affinity for cellulose. Accordingly a number of compounds were prepared and tested, of which examples were exhibited. Although the simple bases of this type had, on account of their solubility in water, an affinity for acetate silk, this affinity diminished as the number of alkali groups increased, thus disproving the hypothesis. This initial failure necessitated a reconsideration of the conditions of the problem, and it was attacked from a different point of view.

A Solution Phenomenon

It would appear that the dyeing of acetyl cellulose, differing from that of wool or true silk, was, in the main, a solution phenomenon, the dyeing factors being conditioned by the following considerations: (1) The presence in the dyestuff of amido, substituted amido, or hydroxyl groups. So-called acidic dyestuffs, or direct cotton colours, which were really also acidic colours, had little or no affinity at all; they left the acetate silk white. (2) When basic compounds were employed as their salts with acids. Such as the hydrochloride dye bases, such salts must readily be hydrolysed by water in order that they might dye, since it was the basis and not the salt which was absorbed by the fibre. (3) The free base should be sparingly soluble in water, and easily soluble in the silk. (4) The molecule should not be too large, since high molecular complexity tended to diminish solubility in non-aqueous solvents, and, therefore, in the fibrous substance. The problem of combining all these conditions was a very difficult one to solve.

Attention was turned to a class of salt which up to the present had met with very limited application in dyestuff chemistry. These were the so-called ω-sulphonic acids of amido compounds. All the sulphonic acids in which the sulphonic group was situated externally to the nucleus possessed the property of being hydrolysed easily. The compound dissociated in the presence of water, giving the amido compound as an aldehyde bisulphite; for example, anilin methyl ω-sulphonic acid was hydrolysed into anilin and formaldehyde-sulphurous acid, a bisulphite compound of formaldehyde.

Azo dyestuffs were built up, depending for their solubility of water upon the presence of ω-sulphonic acid groups, while other sulphonic acid groups were excluded from the structure. The result corresponded completely with anticipations. The dyestuffs were easily soluble in water, and behaved, in general, like ordinary dyestuffs. They dyed acetate silk readily from a slightly acidified bath, and less readily from a neutral or alkaline bath. The acetate silk so dyed contained the compound as free amido base. This was proved by the fact that the latter could be dyed upon the fibre. The amidoazobenzene was taken up by the fibre and then diazotised and converted into other colours.

Properties of "Ionamines"

This prepared the way for the investigation of a large number of new dyestuffs belonging to this class, a selection having been introduced into commerce by the British Dyestuffs Corporation, Ltd., under the name of "Ionamines." According to a private communication from Mr. W. Harrison, he also had prepared, and used, some ω-sulphonic acids for the purpose, but did not pursue the matter beyond preliminary trials.

Those Ionamines which were derived from primary amido compounds, or contained free amido groups, were capable of being diazotised on fibre and produced a wide range of shade—scarlet, violet, blue and black, etc. Those derived from secondary amido compounds were not diazotisable but could be employed for direct shades, the latter limited at present to orange red. All the Ionamines selected dyed acetate silk readily from a slightly acidified bath, or even, in some cases, in a neutral bath at a temperature of 65° to 70° C., at which temperature the fibre retained its full lustre. The range of colour obtainable was extended by the fact that one Ionamine could be mixed with another.

The suitability of compounds of this class appeared to be limited by two factors: (*a*) The free ω-sulphonic acid must be sufficiently soluble in water, for if precipitated in the bath it would escape hydrolisation; and (*b*) the hydrolysed base must be sufficiently soluble in the acetyl silk. Too high a degree of molecular complexity tended to render the dye too

insoluble in the fibre substance. It had been observed that compounds of the ω-sulphonic class which possessed an affinity for cotton had a similar affinity for acetate silk, whereas those Ionamines which had the highest affinity for acetate silk had none for cotton. It was curious, continued the lecturer, that wool behaved entirely differently from acetate silk towards these dyestuffs. Whereas in an acid bath in the presence of acetate silk, when Ionamines underwent hydrolysis, and the base was taken up by the fibre, this did not occur to a great extent in wool. The dyeing of acetate silk could, in general, be most explained by the solution theory. Nearly all substances which dyed this material readily were soluble in benzene or other hydrocarbon salts. This was illustrated on shaking an aqueous solution of Ionamine A with benzene in the cold, when the water remained yellow and the benzene colourless ; but upon warming and shaking the benzene eventually became yellow and the water nearly colourless—*i.e.*, the Ionamine had been dissociated and the base formed had passed into the benzene. Acetate silk resembled benzene in this. It did not absorb water when wetted, and also the interface, like that of benzene, acted as a semi-permeable membrane.

Stability to Hydrolysis

Once within the silk the bases were firmly held, and hence showed excellent fastness to perspiration, washing and soap. In the case of wool, water passed readily into the fibre. The wool substance, owing to its basic components, possessed a natural attraction for sulphonic acid. The ω-sulphonic acid was, therefore, taken up as a whole, and hydrolysis was rather retarded than accelerated. The Ionamines which had so far been produced could be divided into two classes, one containing one sulphonic group, and, secondly, those containing two sulphonic groups. The former had greater stability to hydrolysis. When dyed they were little affected by organic acids. The latter class were more easily hydrolysed. They could be dyed either from an acid bath or from a slightly alkaline or even a neutral bath. When dyed they were readily changed in shades, although when diazotised and developed they gave deep and fast colours.

Greatest Affinity

It would be seen, continued Professor Green, that the dyeing operation could not be compared with the dyeing of cotton with direct colours, or, say, on wool with acid colours. It involved chemical change. It was not simply a question of the dyestuff being taken up as a whole by the fibre, for the reason that there was no possibility of levelling up an uneven shade as in the case of cotton. Results must be obtained at once. It was, therefore, advisable to enter the material at a low temperature and gradually heat up. Although dyeing occurred to some extent, even in the cold, the greatest affinity was accelerated between 65° and 75° C., though it was not advisable to go above 75° C. for fear of injuring the lustre of the silk. The constitution of the dye bath could vary, say, between twenty times the weight of the silk to 100 times but the addition of salts to the dye bath did not assist exhaustion, and was not recommended, except in dyeing acetate silk, cotton unions or a mixture of an Ionamine with a direct cotton colour. Although Ionamines would dye from a neutral bath, hydrolysis, and consequently dyeing, were facilitated either by the presence of an acid or an alkali ; usually about 1 per cent. of formic acid was added to the dye bath.

Period of Diazotisation

Diazotisation and development was effected in a similar manner to the direct cotton colours, such as primulin. Owing to the greater resistance offered by acetyl cellulose, more time was required. The diazotising bath which was used was usually cold weak solution of sodium nitrite acidified with a mineral acid. Diazotisation was usually complete in about five minutes, and the silk was then washed free from acid before being put into the developing bath.

The most generally useful developers had been found to be B-naptholresorcin and B-napthol. A wide range of colours was obtained, fast to washing, and the fastness to light was remarkable. Those most resistant to light were usually obtained with resorcinol. It had been found preferable to employ the developing baths warm.

Dyeing of Union Materials

With regard to the dyeing of union materials, Professor Green said that Ionamines should find important uses. Owing to the fact that most direct cotton colours had no affinity for acetate silk while the Ionamines had a strong affinity for the fibre but none for cotton, it was possible to obtain very interesting effects upon material containing a mixture of cotton and acetate silk, or cotton having designs upon it in acetate silk. By a suitable selection of direct cotton dyestuff and Ionamines, the two fibres could be dyed two colours from a single bath. For example, cotton and acetate silk hosiery could be dyed a deep solid shade by a single dye bath containing a suitable cotton diazotising black with Ionamine A.

Viscose Silk

In the case of viscose silk the Ionamines behaved in the same way as towards the cotton—*i.e.*, they exhibited little or no affinity. Since this fibre was readily dyed with direct cotton colours, it would be seen that two-colour effects were obtainable. With woollen unions the case was quite different. As already explained, Ionamines dyed wool like ordinary dyestuffs without undergoing hydrolysis, and therefore they could be dyed upon acetate silk-wool mixture. Natural silk occupied a position, apparently, somewhat intermediate between wool and artificial silk, but the matter had not been fully studied.

Printing of Acetate Silk

In the matter of the application of Ionamines to the printing of acetate silk, the lecturer said that only preliminary experiments had been made, but they tended to show that the material could very well be employed for the purpose. The process was extremely simple, it being merely necessary to thicken the solution of Ionamine with an ordinary starch thickener, print it upon the material, dry it, give it a short steaming for a minute or two, then wash off, and the colour would be found to be fixed. With a mixed material of cotton and acetate silk the colour would only fix itself upon the acetate silk and leave the cotton white, just as it did in the case of dyeing.

A considerable number of illustrations were given showing the results obtainable by means of Ionamines.

Santa Catalina Nitrate

Estimate of World's Probable Consumption

PRESIDING at the twenty-second annual general meeting o the Santa Catalina Nitrate Co., Ltd., held on Monday at Winchester House, London, E.C., Mr. F. G. Lomax said that only the exceptionally small quantity of 44,000 quintals of nitrate had been dealt with, and, consequently, their trading profit was but £2,983, which, with income in the shape of interest on cash deposits and dividends on securities and profit on investments sold, left, after deducting London expenses, a net gain of £4,390. Their oficina having remained closed, the cost of upkeep had been £5,459, and in order to meet the bulk of this outlay £5,000 had been transferred from reserve, so that, with the profit referred to, and the balance of £4,691 on profit and loss account brought in, they were able to pay a final dividend of 5 per cent., making 10 per cent. for the year.

Effect of Price Reductions

The reduction of prices agreed upon had put some life into a market that had become inert, with the result that the demand thus created had reduced the Pool's holdings to an extent which seemed to warrant the hope that sales by producers might be resumed at an early date, but unfortunately a combination of circumstances prevented the fulfilment of that expectation. Towards the end of the season, however, stocks in consuming centres were being brought down to something approaching a normal level, and when in May the Nitrate Association fixed the scale of selling prices from July 1 onwards it was promptly responded to by activebuying, the quantity sold to date being slightly over 1,100,000 tons. A careful estimate was made some weeks ago of the world's probable consumption of nitrate, the total computed being 1,825,000 tons.

The Treatment of Caustic Lime Sludge

By a Chemical Engineer

The writer gives a brief description of a plant which is claimed to be capable of drying caustic lime sludgeat a cost which enables it to be marketed at a profitable price

THE fact that waste material is not put into marketable form more frequently is not from any lack of desire so to do or from the absence of the individual asking another why somebody else does not do it, but it is usually a question of cost and market. Other factors come into the account, such as quantity of the waste material available, proximity to the point or points of use, the quantity the market will absorb, the price, and other smaller factors.

Among the numerous waste products caustic lime sludge (carbonate of lime) is by no means the smallest. It is the waste lime from the causticising of carbonate of soda. Somewhat similar waste is obtained from water purification plants, etc. Owing to the physical character of this carbonate of lime and its large water content (from 35 to 45 per cent.), it has, up to the present, been impossible to dry it and place it on the market at a price which is competitive with ground lime. The usual method previously adopted for drying this material was to place it on heated platforms by hand labour. The nature of the material necessitates frequent turning, again by hand, and, finally, the difficult operation of removing the dried lime from this heated platform for the purpose of bagging. This method is costly, not only in fuel but in labour, and has the further disadvantage of being slow and not giving a good product. Owing to the fact that this material clings to all metal and other surfaces, it has not, until recently, been possible to elevate or otherwise convey it by any known mechanical means. Numerous attempts have been made to dry it in plain rotary tubes, or rotary tubes with worms, scrapers, etc., but owing to its tacky nature these attempts have failed. As it has been recognised that, apart from the possible revenue-earning capacity of this material, it is ideal as a fertiliser and for certain other purposes, there is no doubt that the experiments were warranted. The carbonate of lime is in a fine state of division, and it possesses no sharp edges like ground limestone.

The principle applied by the Fusion Corporation Ltd., Middlewich, Cheshire, in their low-temperature retort (Stainer Hutchins' patent) has been applied with success to the extraction of liquids from solids and the addition of liquids to solids. The principle permits of the treatment of plastic or tacky materials without fear of blockage. In the drying of caustic lime sludge the problem is obviously the extraction of water.

The plant consists substantially of a rotary tube (the size of which depends upon the tonnage of material to be dealt with in a given time). At each end of this tube is fixed a path ring or tyre, each of which in turn rests upon two, or more, rollers. This arrangement permits of the rotation of the tube. The rotation is effected by any suitable power available through spur or other gearing. Inside this tube there rests one or more (usually three) breakers. These breakers are placed loosely in the tube and are in the form of, or similar to, elongated steamer paddles; but whilst paddle wheels may have, say, 50 or more paddles or blades, the Fusion breaker usually only has from four to six. The dimensions across the ends of the blades are usually about two-thirds of the internal diameter of the tube. The tube revolves at from 5 to 10 revolutions per minute, and as it revolves the breakers fall over and over on to their different blades, but owing to the fact that these breakers rest at or near the bottom of the tube, and that the material being treated is at or near the bottom of the tube, the blades do not come into direct contact with the metal surface of the tube, but fall upon and give a slicing or hammer blow to the material being treated. The material to be treated is fed in at the hot end of the tube, thus giving a uniflow effect. The dried material leaves the " cold " end of the tube and the coarser parts are carried by means of an elevator to a storage bunker. The lighter parts are carried to one or more cyclones by means of an exhausting fan. This exhausting fan has an additional use in the event of internal heating being applied as described below. Where external heating is not employed screens take the place of the air separation of the finer particles.

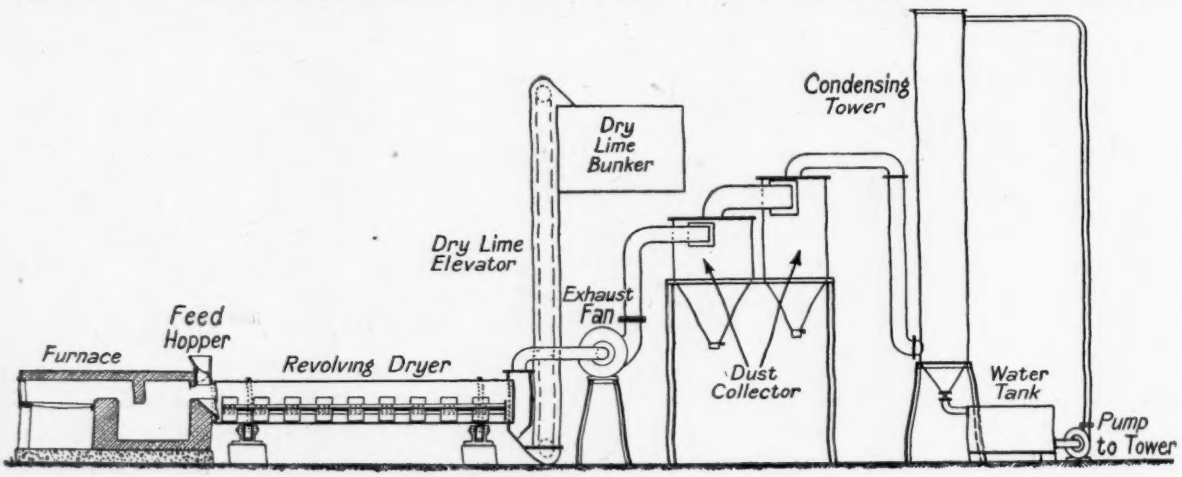

Fig. 1.—Diagrammatic Layout of Plant

Methods of Heating

Two methods of heating may be employed :

1. Internal heating where the products of combustion either from a separate furnace or from boiler flues come in direct contact with the material being treated, and the exhausting fan referred to above is utilised in such cases for " pulling " the gases through the tube and at the same time carrying with them the finer particles of the lime, which settle in one or more cyclones, according to requirements.

2. Where external heating is desirable—*i.e.*, where it is desirable that the products of combustion should not come into contact with the material being treated, the tube is heated externally.

It will be obvious that the water which is driven off from the material passes in the form of steam, and to prevent the possibility of nuisance a condensing tower is fixed after the cyclone or cyclones.

The finished product from caustic lime sludge, as stated, is very finely graded, and 95 per cent. would pass through a 200-mesh sieve. Analysis shows that the water remaining is simply a trace. Fig. 2 shows the action of the breaker; Fig. 1 shows the diagrammatic layout of a plant. In a small plant now at work, and capable of dealing with 100 tons of lime sludge per week, the products of combustion are applied internally—*i.e.*, in direct contact

with the material to be treated—and these products of combustion are obtained from a separate small furnace. Two cyclones are employed in this plant. It was desired to recover, for special reasons, the finest particles of the lime. On the extreme left of the plant is a steam condensing tower. Water is circulated through this tower by means of a centrifugal pump, and is taken from and returned to a tank, approximately 30 ft. by 6 ft. by 18 in. deep, quite sufficient for the purpose.

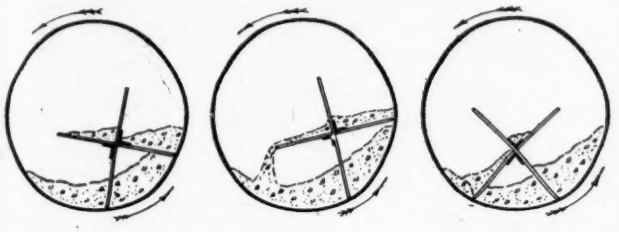

Fig. 2

The cost of running a small plant capable of producing sixty tons per week of finished product, assuming continuous running, would be :—

	s.	d.
Cost of process labour, per ton of finished material ..	4	1
Cost of power, per ton of finished material		6·3
Cost of fuel, per ton of finished material	2	8·75
Total per ton of finished material ..	7	4·05

In the event of boiler flue or other sufficiently hot gases being available, item No. 3, "Cost of Fuel," would be eliminated.

Lagunas Syndicate

The Necessity of Greater Consumption

SPEAKING at the twenty-second annual meeting of the Lagunas Syndicate, Ltd., held on Tuesday at Winchester House, London, Sir Robert Harvey (the chairman) said that advantage was taken of the closure of the oficinas to change the system of carrying the caliche to the crushers at South Lagunas. A belt conveyor had been installed, which, in addition to other advantages, enabled a division of the fines—*i.e.*, the small piece of caliche—for the purpose of treatment in separate tanks. It was claimed that this method would lead to an improved yield and consequent reduction in the cost of manufacture.

Continuing, the chairman said the South Lagunas oficina was reopened in August last, and its output would enable them to meet all the allocations which could be made under their quota. They were continuing the manufacture of potassium nitrate because a little better demand for this commodity was springing up, and they had made some small sales at a premium which helped to increase their profits. The actual quantity of pure nitrate of potassium available, which was principally exported from India and amounted to about 100,000 tons per annum, was insufficient to meet the world's demand. In the past the deficit had been manufactured from ordinary nitrate of soda by the addition of potassium chloride or sulphate. The price of pure nitrate of potassium was about £30 per ton, and consequently it suited the manufacturer to pay an increased price for nitrate of soda containing a good percentage of potassium nitrate.

In emphasising the necessity of a greater consumption and the removal of all hindrances to a free marketing of nitrate of soda, Sir Robert Harvey referred to the large stocks held by the Pool last year and to other factors which, he said, entailed considerable losses and sacrifice to all concerned. Reviewing the present position, he pointed out that the industry was controlled by a combination, the management of which was practically in the hands of the directorate at Valparaiso. It was true, there was a committee in London, the powers of which, it was generally thought, might with advantage be extended. This combination was established for five years and would expire in 1924, but as it would be impossible to fix forward prices from June, 1923, with the possibility of so early a dissolution, it was evident that some decision as to its renewal or extension would have to be arrived at in the early months of next year. So far the association had sold 22,586,889 quintals, but until the greater part of this had passed into the hands of the smaller dealers further sales on a large scale could not be expected. With regard to the report that Germany and Poland would be compelled to take nitrate, Sir Robert Harvey said that if the requisite financial facilities could be arranged considerable quantities would probably be sent to those countries.

Chilean Nitrate Committee

The conditions prevailing in the world's markets were not conducive to business, but the importance and need of nitrate was so universally recognised that they could with perfect confidence look forward to an expansion in the consumption. A tribute must be paid to the activities of the Chilean Nitrate Committee. For some time it had been recognised that more money should be spent on propaganda, and the producers had now agreed to a larger contribution, which would allow of material extensions. Special attention was being given to the old consuming countries, notably the United States, and what might be termed new consuming markets were being energetically developed. Referring to his earlier remarks on the negotiations for the renewal or, at any rate, some extension of the combination, the chairman said that, generally speaking, the association had been helpful to the producers, and might easily have been more so. While admitting the many difficulties which the association had to face, it was considered in many quarters that certain modifications might well be introduced into the general administration.

Greater attention should undoubtedly be paid to the opinions on this side, as they reflected the knowledge and experience of people who for nearly half a century had been engaged in the trade and were intimately acquainted with all its manifold ramifications. For instance, it was now generally admitted that the prices for the current year might have been fixed at figures which would have given an average of at least 6d. per quintal more without in any way affecting the consumption, and the importance of these extra pence could not be too strongly urged, because the quotations now fixed—after providing for the contribution to the Pool and the extra propaganda expenses—left but a small margin of profit even to the best equipped oficinas.

The Manchester Chemists' Exhibition

[FROM OUR OWN CORRESPONDENT.]

WHILST every conceivable product, from corn cures to hair tonics, and baby foods to cough mixtures, as well as the thousand-and-one side-lines which constitute the every-day stock-in-trade of the modern pharmacist—were to be seen at the Chemists Exhibition which opened in Manchester on Monday for a week, there was a disappointing display of those goods which, after all, form the basis of what may be termed the legitimate side of the pharmacist's business.

Few of the many "war babes" have been so much in the public eye during the last few years, for one reason or another, as the fine chemical industry. And yet few indeed of the great British firms who have developed this branch of chemical manufacture, as distinct from the manufacturing chemist, have taken the opportunity of bringing before the man who plays a big part in the ultimate destiny of their goods—some, at least, of the many products they are now turning out.

Among the general exhibitors were : The Anglo-American Oil Co. (with petroleum specialities) ; Brook, Barker and Co., Bradford (crude drugs, fine chemicals, and pharmaceutical preparations) ; A. and F. Pears, London, John Knight, Ltd., London, F. S. Cleaver and Sons, Twickenham, D. and W. Gibbs, London, Arthur H. Cox and Co., Brighton, David Thom and Co., Manchester, and Cussons, Sons, and Co., Manchester (toilet soap and allied products) ; Cresols and General Antiseptic Co., London (Lysol products) ; Howards and Sons, Ilford (bismuths, ethers, iodides, salicylates, etc.) ; J. M. Smith and Co., London (disinfectants) ; Sofnol, Ltd., London (water softening and gas absorption chemicals) ; and Chas. Zimmermann and Co., London (photographic chemicals and appliances).

The Thermal Syndicate, Ltd., Wallsend-on-Tyne, with their acid and heat-resisting ware, and Meldrums, Ltd., Timperley, near Manchester, with their acid-resisting cocks, valves, and pumps, were also prominent among the exhibitors.

The Damage of the Debts

By Sir Ernest J. P. Benn, Bart.

THE full significance of the downfall of Lloyd George will only slowly dawn upon the world. He was the last of the big four, and being gone, the road is clear for that complete revision of our thoughts and ideas which has been so necessary, although we have not all known it, ever since the signing of the Treaties of Peace, which were their work. This journal, concerned alone with industrial and commercial considerations, has nothing to say of those parts of the Peace Treaties which deal with territorial and political questions; but when it comes to the financial aftermath of Armageddon, with all its disastrous effects upon commerce and industry, THE CHEMICAL AGE is well within its province in inviting its readers to re open in their minds all the consequences involved.

International Indebtedness

Trade and industry are suffering from international indebtedness, not only the payment of reparations and indemnities involved in the Peace Treaty, but the even larger mass of interstate debt which exists between the various allies engaged in the Great War. From a commercial point of view, the effect of the indemnity due from Germany to France is almost exactly the same as the effect of the debt from France to England. Ledger accounts do not go into reasons and motives, they merely record figures, and if one nation owes another a couple of thousand million, the balance-sheet is no better or no worse because of the circumstances which have led up to the records of the debt. There are two distinct considerations involved in this question. There is, first of all, the existence of the debt itself, and, secondly, and much more important, the fixing of its amount. If one nation owes another a definite sum of money, and definite terms of repayment are arranged, the exchanges of those two nations will accommodate themselves to that known position and the debt will not cause the exchanges to fluctuate. As the debt is gradually paid, the currency of the debtor will improve gradually, but that operation will take place in the daylight of knowledge, and no business man will be involved in any serious risk on its account. The existence of a big debt from one nation to another will, of course, have very serious consequences upon the relative standard of wealth and comfort of the two countries, but that standard being known and fixed, will enable each of the countries to get along with its business. The most pressing question in connection with the debts is, therefore, their determination. Recent happenings between England and America illustrate very graphically the importance of this part of the problem. Some months ago there was a talk of cancellation of the American debt; such an operation would appear on the face of it to be to the advantage of England, and yet the mere talk of cancellation knocked down the value of the £ in New York. Subsequently it was decided that the debt must be paid, and a beginning was made in the remittances for interest. The definite knowledge that the debt would stand, and that England would, therefore, be the poorer, has had, as all the world now knows, the paradoxical effect of actually improving the English rate of exchange against the dollar. Nothing could illustrate more clearly the advantage of establishing a definite position in these matters.

Some Business Considerations

The business world is, therefore, entitled to demand of the politicians that they shall give up conferences, make up their minds, say what they want, and leave it at that. Whatever they decide, however bad may be the decisions, as long as they are really decisions, the position will be one that people can understand and the ordinary work of the world will be able to proceed.

But in view of the changed political situation and the real possibility that some of these questions may approach a settlement, it would seem worth while to set down a few simple business considerations, which, at this juncture, four years after the cessation of hostilities, can be stated without national bias, and with some prospect of attention, even by the man in the street.

Money was not invented for political purposes, and the use of money by politicians, the attempt to make it express national aspirations, national hopes, and national hatreds, is a very definite and easily demonstrable abuse of it. The Marxians are very largely responsible for the muddled thinking of the world on these matters. They have led us to believe that money or capital is something which has an existence of its own, apart from other things, and they have worked up half the world into a condition of mind when they look upon money as a trick of the employing classes, by means of which they keep the so-called workers in subjection. Millions of workers in every country are, therefore, unconcerned when a proposal is put forward for the payment of large sums by one nation to another. They visualise the writing of cheques by the wealthy, the handing over of notes by one Treasury to another, the transfer of motor-cars, diamond rings, and other luxuries which to them are synonyms for money, and they fail altogether to realise the real importance of these discussions. It is the universal failure to understand the very nature of money that is at the bottom of our difficulties on these questions of international indebtedness.

We live by exchange; that is a truth which requires constantly to be reiterated. The world-wide socialistic movement is a failure to understand it. It is a physical impossibility to transfer wealth from one individual to another, or from one nation to another, as a general proposition, unless there is behind the transaction what the lawyers would call a proper consideration. We do not live by handing about money, but by the exchange of goods and services, one with another. The making of the goods which we all use and enjoy is the simplest part of the operation. That is what the Marxians never understand. The manufacture of things is child's play compared with the difficulties of arranging their exchange. That is the answer to the commponlace lie that all wealth arises from land and labour. Wealth arises, for the most part, from exchange, and if we had to rely upon land and labour our wealth would be but an infinitesimal part of what we now enjoy. But how does this apply to the problem of international indebtedness? The application is surely very simple. If we live by exchange, money is the medium of exchange. Money was invented by business people to facilitate exchange. In the course of centuries, money, credit, and finance, has been so perfected as to make it possible for the child with a penny piece in London to command the services of the toy-maker in Japan, or for the woman in the bazaar in India to call to her assistance the spinners and weavers of Lancashire.

The existence of money as a separate commodity lends itself to well-known abuses—the most obvious of which is gambling. It is possible for one man to gamble with another, and for comparatively small sums of money to change hands without adequate consideration in this way. Money used for the purposes of betting is not used as a medium of exchange, and betting is, therefore, an abuse of the money system. But because a small class of persons can transfer in this way small sums of money from one to another, without upsetting the whole of the social economic organism, it does not follow that nations can safely practise the same abuse.

Another simple illustration may help to make more clear the argument. Under the present money system a father may leave to his son a fortune, thus enabling that son to live for the whole of his life in idleness; to most unthinking people this is a very desirable arrangement from the son's point of view, but there are many who would hold, and I think, rightly hold, that unless the son is peculiarly gifted with a sense of responsibility, he has, in fact, the worst of the bargain. But it is obvious that if it could be arranged that one nation were to provide another with the means of subsistence, and relieve it of any need to toil and labour, the nation for which such provision was made would quickly disappear.

Cancellation of Debts

The economists have debated this matter so thoroughly, and have arrived at such divergent views by processes of reasoning which are beyond the capacity of the ordinary man, that it is at least reasonable to suggest that the universal experience of the last four years may enable unscientific people to arrive at something approximating the truth of these questions. Is there anyone who will deny that if all the debts between governments existing in the world to-day were cancelled the position of everybody, whether creditor, or debtor, would be infinitely improved? Is there a tax-payer anywhere in the world, except perhaps in France, who is still

Mr. C. S. Garland, M.P.

Dr. G. C. Clayton, M.P.

Lt.-Commdr. F. W. Astbury, M.P.

Prominent among the newly-elected Members of Parliament is Dr. G. C. Clayton, a director of the United Alkali Co., Ltd., who defeated Mr. Arthur Henderson, the well-known Labour leader at Widnes. Chemical engineering is represented by Mr. C. S. Garland, who in a message to THE CHEMICAL AGE *affirms his conviction that the return of the Conservative Government will mean greatly improved trade, in which Chemical industry should be one of the first to benefit. Although not directly concerned in the industry, Lt.-Commander Astbury took an active interest in the dyestuffs controversy. He states in a letter to* THE CHEMICAL AGE *that although he is a Free Trader, he refuses to be bound by that policy when he feels confident that certain key industries, like the dye industry, are necessary to retain the trade of the country.*

foolish enough to hug the delusion that the payment of any of these debts will reduce by a fraction any of his burden of taxation? Is there a single Budget in the world which during the last few years has taken any sensible or serious consideration of these items? Is it not the fact that the only effect of the existence of these hypothetical amounts has been so to upset the money market as to make it impossible for most of us to know the value of the money in our pockets, and render it doubly difficult for us to get along with the ordinary business of exchanging between man and man those services which we are each able to render to the whole?

Lessons of the Election

The recent Election brings all these questions very vividly to the front. Four years ago the British people were unanimous in their determination to recover to the uttermost farthing the cost of the war. After four years, not only has no single farthing been received, but the chasing of these phantom millions has cost the English people tremendous wealth and untold suffering. They are faced to-day with a National Budget which is almost as oppressive as during the progress of the war itself; they have unemployment on an unparalleled scale; their trade is still very near to its lowest depth, and there is less prospect than ever there was of recovering a single farthing piece from any of their debtors, whether enemies or allies. The slow realisation of these facts has at last brought about the downfall of Lloyd George, the end of supreme conferences, and the dropping of the notion that the welfare of the world can be assured by the acts of a few politicians. The return of the nation to normal political arrangements will, it may be hoped, signify the abandonment of the practice of amateur political dabbling in finance, and lead the way to the abandonment of the stupid notion that debts between governments are practical or possible, or that they can do anything but damage to the peoples afflicted with these governments, whether they be creditors or whether they be debtors. Economic war is a war of mutual destruction, there is no victory possible; all parties must always be beaten.

Affairs of a Chemical Merchant

MR. N. G. PRINCE, 83, Friory Road, West Hampstead, London, who had been engaged in the chemical trade, attended before Mr. Registrar Mellor at the London Bankruptcy Court, on Tuesday, for his public examination on a statement of affairs in which he returned his liabilities at £3,411, of which £2,036 were expected to rank, and an estimated surplus in assets of £2,340. In reply to the Official Receiver, the debtor said, that having come into this country from Poland he was first employed by an American chemical company as their English representative. In 1899 he began business on his own account as a chemical importer at Aldershot, but the business was not a success, and in the following year he entered the employ of a firm of manufacturers. Soon after the outbreak of the war he became agent for an American chemical company, and sold chemicals on commission to munition contractors until the end of 1916. He was afterwards engaged for nearly three years in cold storage research work, and during that time discovered a new and improved composition for use in cold storage. The debtor interested two other persons in the process, and they found sums of money amounting in all to £12,500, with which was acquired freehold property before the formation of a limited company for the purpose of putting the new process on the market. A company styled Insulators, Ltd., was formed in September, 1919, with an initial capital of £75,000, and acquired the process and premises. The company traded with success for about a year, but since 1920 adverse industrial conditions had seriously hampered the business. The debtor attributed his failure to his having made himself personally liable for goods supplied to Insulators, Ltd., to his liability to the petitioning creditor for cash advanced for the purchase of a motor car used exclusively for the business of the company, and to the company having failed to pay him the balance of £1,000 of the purchase consideration, with the result he had been unable to repay the like amount to the two persons before mentioned. The examination was concluded.

From Week to Week

Mr. Michael Herbert and Mr. William Henry Johnstone have joined the board of directors of John Bell and Croyden, Ltd.

Mr. James Boyd, late of the British Asbestos Company, Ltd., died on November 19, at 102, Derwent Road, Palmer's Green, London.

Mr. F. J. Shand has retired from the board of Nobel Industries, Ltd., and Mr. John Rogers, F.I.C., has been appointed director in his stead.

Mr. W. L. Thomson, A.I.C., has been appointed works manager to Ernest Jackson and Co., Ltd., manufacturing chemists, Crediton, Devon.

The Anglo-Chilian Nitrate and Railway Company, Ltd. announce the removal of their offices to 4, London Wall Buildings, London, E.C.2.

Uranium Phosphate deposits discovered in Madagascar in 1920 are now being worked and it is estimated that 18 tons will be exported this year.

Mr. Francis William Gilbertson, who is a director of the Slag Phosphate Co., Ltd., and of W. Gilbertson and Co., Ltd., has been elected a director of the Great Western Railway Co.

An explosion in the powder-drying magazine of the Pfälzische Pulverfabriken, Bavaria, resulted, it is stated, in its entire demolition and considerable damage to adjoining buildings.

Clifford Christopherson and Co., of London, sole European agents for the "Three Elephant" brand of borax, announce that as from Wednesday, November 15, the price of their borax is reduced by £1 per ton.

J. M. Steel and Co., Ltd., announce that on and after November 27 their address will be 7-8, Poultry, London E.C.2. Their cable address, "Coaltar, London," will remain the same, as also will their telephone numbers, "City 2806-7.'

A marriage was solemnised at Selby Abbey on November 16 between Mr. Frank A. Helme, a chemist employed by the Yorkshire Dyeware Company, Leeds, and Miss Dorothy M. Sambrook. After a reception the bride and bridegroom left for Torquay.

Mr. W. Macnab delivered a Hurter Memorial Lecture at a meeting of the Liverpool Section of the Society of Chemical Industry on Wednesday. The subject of the lecture was "Some Achievements of Chemical Industry in this Country and in France."

John McCall and Co., manufacturers of iron oxide, spent oxide and retort carbon, of Athboy, co. Meath, inform us that they are now lifting excellent ore, of which thousands of tons are in sight. They add that if the country would only settle down, a large trade could be done.

A petition to extend the objects of Vickers, Ltd., was heard in the Chancery Division on Tuesday, as a result of which the company has now power to deal with explosives, manufacture all classes of optical and scientific instruments, certain chemicals, construct cement works and carry out research work.

The Prince of Wales, as patron of the Ramsay Memorial Fund, received, on Wednesday, at St. James's Palace, the gold medal of the Ramsay Fund, which was presented to him by the French Ambassador, the Comte de Saint-Aulaire, one of the vice-presidents of the fund. The medal was executed by an eminent French sculptor, M. L. Bottee.

An assistant lecturer in physics is required at the University of London, King's College. Opportunities will be given for research work, and the duties will commence in January next. Particulars of the appointment may be obtained from the Secretary, King's College, Strand, London, to whom applications should be sent by November 30.

It is announced that the United States Government has proposed to the Allies that payment for the cost of maintenance of the United States Army on the Rhine should be made by dyestuffs handed over by Germany under the reparations scheme. It is understood that the administration will have to obtain the approval of Congress to this measure.

At a meeting of the Nottingham Section of the Society of Chemical Industry, held at the University College, Nottingham, on Wednesday, the following papers were read: "Bleaching Cotton with Hypochlorous Acid," by S. R. Trotman, F.I.C.; "The Action of Ozone on Wool and Chlorinated Wool," by S. R. Trotman, F.I.C. and D. A. Langdale, A.I.C.

Lecturing at the Royal Academy, last week, on the "Preservation and Cleaning of Pictures," Professor A. P. Laurie, Professor of Chemistry to the Royal Academy, said it must be understood that the solvents used in picture cleaning for the removal of varnish would also remove the paint layer, and therefore the avoidance of injury depended entirely upon the skill of the cleaner.

An agreement is said to have been signed between the Union Corporation, Ltd., and Minerals Separation, Ltd., relative to the treatment of the sands of the Modder Deep Gold Mining Co., who are about to commence the erection of a flotation unit. It is claimed that the adoption of flotation on the Rand would result in various advantages over the present system of gold extraction.

At a meeting of the Yorkshire section of the Society of Chemical Industry, held on Monday at the Queen's Hotel, Leeds, Messrs. R. A. Mott and H. J. Hodsman contributed a paper dealing with "Factors influencing the ammonia yield in the carbonisation of coal." Arising out of another paper contributed by Messrs. Hodsman and P. Wedgwood "Volatile Matter in Fuels" was also discussed. Professor Cobb was in the chair.

It has been reported to the Brighton police that Mr. Charles Hoar, aged 73, described as a member of the firm of Hara and Hoar, colour merchants, of Thomas Street, Burdett Road, London, has disappeared from a nursing establishment in Norfolk Terrace, Brighton, where he and his wife have been staying for some days. Mr. Hoar went out on Tuesday, and has not been seen since. It is stated that he had a considerable sum of money in his possession.

Surplus sulphur produced by the Texas Gulf, Union, and Freeport-Texas companies, according to advices from U.S.A. will be sold abroad, several men being sent to foreign countries to arrange the details. Shipments of sulphur through Galveston and Texas City are estimated at 484,966 tons for the year ended October 1. These figures do not include shipments from Freeport, which exported 204,728 tons, a further 280,238 tons going into domestic use.

On Tuesday in the Companies Winding-Up Court Mr. Justice P. D. Lawrence had before him a petition by V. C. North and Co. for the compulsory winding up of Sapon Soaps, Ltd. Counsel for petitioners said this was a creditors' petition for winding up the company. His instructions were that the company was insolvent. Counsel for the company said his client could not resist the petition if it were pressed. The company were prepared to call a meeting for voluntary winding up owing to insolvency. His Lordship said the company was obviously insolvent, and must be wound up, and he therefore made the usual compulsory order.

A tablet in memory of Lieut.-Col. E. F. Harrison, formerly director of the Chemical Warfare Department, and 29 other fellows of chemical societies who died in the war was unveiled by Lord Crawford on November 16 at Burlington House, London. The memorial takes the form of a bronze tablet mounted upon marble, and represents a scene in a trench with British soldiers about to adjust their gas masks. The names of the fallen are inscribed on the tablet. Lord Crawford spoke of the terrible menace and deadly effects of German gas attacks, and said that British chemists succeeded after a time in perfecting defences which not only kept pace with German frightfulness but actually got ahead of it.

Reporting to the London County Council on the recent fatal explosion at premises in Sidney Street, Stepney, caused by the mixing in a mortar of chlorate of potassium and sulphur, the Public Control Committee state that, from the facts disclosed, there would seem to be no doubt that the explosion was caused by friction occasioned during the mixing of the powders. The manufacture of such a mixture for fireworks is prohibited by an Order in Council under the Explosives Act, 1875, and, moreover, the deceased occupier was not licensed by the Home Office for the manufacture of explosives. The circumstances of the case point to the fact that the manufacture of fireworks was being carried on secretly. It is essential that it should be clearly understood that an offence is committed by the manufacture of the mixture in question, and, in conclusion, the Committee state they are causing inquiries to be made with a view to ascertaining the prevalence of the practice.

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Abstracts of Complete Specifications

187,263. DESTRUCTIVE DISTILLATION OF COAL AND LIKE CARBONACEOUS MATERIALS. F. J. West, F. West, and West's Gas Improvement Co., Ltd., Albion Ironworks, Miles Platting, Manchester; H. D. Madden and F. Boardman, Grangetown Gasworks, Cardiff. Application date, February 10, 1922.

A vertical retort is provided with a coke extractor worm at the bottom, supported on a fixed column, through which the worm shaft passes downwards to the exterior of the retort. The upper part of the worm shaft is formed with a groove or channel, and a mixture of steam and air is admitted to the lower end of the hollow supporting column. The mixture passes along the channel in the shaft and is delivered into the coke through openings adjacent to the worm surface. The steam and air may be admitted alternately instead of together. An increased output of gas is obtained without any increase in the heat applied to the exterior of the retort.

187,296. ORE CONCENTRATOR TABLES. E. C. R. Marks London. From E. I. du Pont de Nemours and Co., Wilmington, Del., U.S.A. Application date, July 12, 1921

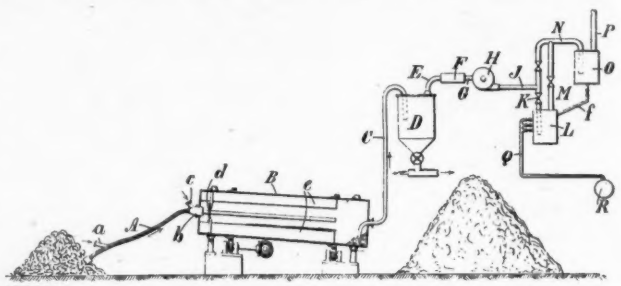
The object is to improve the durability of the surface o ore concentrator tables, for which purpose the surface i covered with fabric coated with a cellulose ester such a pyroxylin. The solvent for the pyroxylin preferably consist of amyl acetate 15 per cent. and wood alcohol 85 per cent. or amyl acetate 50 per cent. and benzene 50 per cent. The pyroxylin is dissolved in the proportion of about 10 oz. per gallon of solvent, and a number of coats are applied to each side of the fabric. It is found that the flexible film of pyroxylin thus obtained is very resistant to abrasion by the ore, and is not affected by sulphuric acid which may be present in mine waters. The table thus covered is lighter, and a saving in power is thereby affected.

187,313. METALLIC LEAD FROM LEAD SULPHATE, PROCESS AND PRODUCTION OF. F. E. Elmore and the Chemical and Metallurgical Corporation, Ltd., 701, Salisbury House, London, E.C.2. Application date, July 14, 1921.

The process is for the reduction of finely divided lead sulphate which is chemically produced by precipitation—*e.g.*, by the action of sodium sulphate on a mixture of lead sulphate and lead chloride produced in brine processes for the extraction of lead ores. The usual blast furnace method for the treatment of lead ore containing lead sulphate is not suitable for the treatment of the chemically produced compound. The finely divided lead sulphate is mixed with finely divided charcoal, bituminous coal, anthracite or coke, in sufficient quantity to reduce the whole of the lead sulphate. About 4–8 parts of carbon are necessary per 100 parts of lead, and an excess of carbon is avoided. The mixture is fed continuously to a crucible heated to about 800°–1,000° C. in the absence of air, and the reduced lead is continuously withdrawn through a syphon at the bottom. The small proportion of carbon and the absence of oxidising gases reduces the tendency to form slag, so that continuous working is possible.

187,320. NEUTRAL AMMONIUM SULPHATE, MANUFACTURE OF. J. Marr, 86, Mona Road, Sheffield, and The Coke Oven Construction Co., Ltd., 155, Norfolk Street, Sheffield. Application dates, July 16, 1921, and April 26, 1922.

The apparatus is for drying and neutralising salts such as ammonium sulphate, but is also applicable for drying pulverulent materials such as coal or coke. A flexible feed conduit A is provided with branch inlets *a* and *c*, and delivers to a drier B provided with a baffle *d* near the inlet to distribute the material. The drier is continuously rotated, and is provided with shelves *e* to agitate the material. A pipe C leads to a receiver D connected to a dust filter F, fan H, and absorber L. The latter may be connected by a pipe M, N to a second absorber O, and by a surface draw-off pipe Q to a receiver R. The powdered material is drawn through the apparatus by suction, but the drier B and receiver D are sufficiently large to allow the material to be deposited. The crude ammonium sulphate is drawn into the conduit A and is treated with ammonium gas drawn in through the inlet *a*. Hot gases are supplied through the inlet *c* in sufficient quantity to dry the salt, but not to raise its temperature above 80° C. The salt at the lower end of the drier B is free from pyridine, and is drawn into the receiver D, where it is allowed to settle. The gases are freed from dust in the filter F, and then pass into the absorber L, where the pyridine and excess of ammonia are absorbed in acid until the liquor becomes neutral. Continued passage of the gas liberates the pyridine, which floats



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on the surface and may be drawn off to the receiver R. If the quantity of pyridine is too small to be run off, the absorber L may be heated, when the liquor becomes alkaline, so that the pyridine is volatilised with excess of ammonia and passes to a second absorber O. The gas may be diverted direct to the absorber O to permit the absorber L to be recharged with acid. The ammonium sulphate liquor in the absorber L is now free from pyridine, and may be returned to the saturator. The absorber L may then be recharged with liquor from the absorber O, and the latter with fresh acid. A ball mill may be combined with the drier to break up any agglomerations of the material.

187,335. ALCOHOL FUELS. S. W. Blake, De Rust, Oudtshoorn, Cape Province, South Africa. Application date, July 19, 1921.

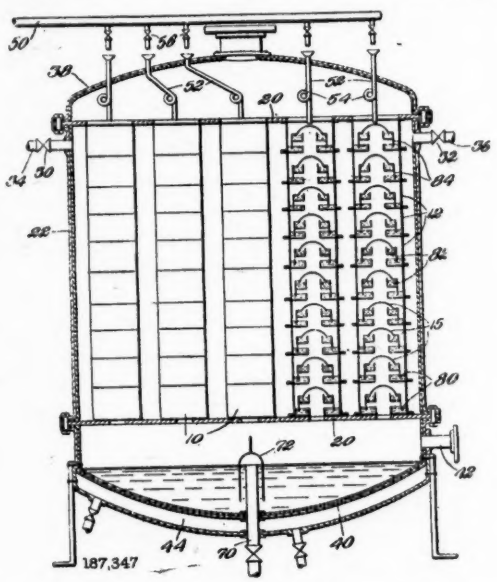
Specification No. 178,498 (*see* THE CHEMICAL AGE, Vol. VI., p. 704) describes the production of an alcohol fuel from a mixture of alcohol and acetone which is treated with calcium carbide in a pressure-resisting vessel until the acetylene is mainly absorbed. It is now found that other fuels of high calorific value may be obtained by the use of other monohydric alcohols, such as amyl, butyl, and propyl alcohols. The alcohol used should be of a strength of 90–92 per cent., so that the water content of the fuel is available for the generation of steam. The proportion of acetone may be 5–40 per cent., and the calcium carbide is added in the proportion of ¼–½ lb. per gallon. The liquor is kept alkaline by adding ammonia, and carbon dioxide is then passed through to precipitate the lime. Alternatively, ammonium carbonate may be added.

187,336. COAL, CARBONISATION OF. J. Roberts, 31, Graigyfedw, Abertridwr, Glamorgan. Application date, July 20, 1921.

In the low temperature carbonisation of coal difficulties are experienced, due to the expansion of the coal and the low heat conductivity and porous nature of the coke. In this invention the expansion of the coal at a temperature of 600°–760° C. is avoided by using a mixture of caking and non-caking coal in such proportions that the excess of binding material liberated by the caking coal is absorbed by the non-caking coal. Several examples are given of the application to particular varieties of coal. The non-caking coal may be replaced by a caking coal which has been subjected to preliminary heat treatment and oxidation at 100°–350° C., whereby the caking properties are destroyed. It is found that when these mixtures of coal are carbonised at temperatures of 600°–760° C., the hydrocarbons are decomposed in passing through the carbonised layers, so that carbon is deposited, and a dense coke similar to that usually produced at temperatures above 900° C. is obtained.

187,347. ETHER, APPARATUS FOR MAKING. H. Wade, London. From F. E. Lichtenthaeler, 173, Milk Street, Boston, Mass., U.S.A. Application date, July 27, 1921.

In the usual process for the manufacture of ether by the addition of alcohol to sulphuric acid, tarry decomposition products are usually formed owing to inequalities in the distribution of the alcohol in the sulphuric acid and consequent overheating of the alcohol. Further, the acid is rapidly diluted by the water produced in the reaction. The object is to avoid these difficulties and to produce ether by a continuous process. A number of heating units 10 contained in a casing 22 are built up of separate chambers 12 arranged one above the other. The sulphuric acid is contained in annular troughs in these chambers, and alcohol vapour is caused to bubble through the sulphuric acid by means of baffles 15. The ends of the heating units 10 are secured to



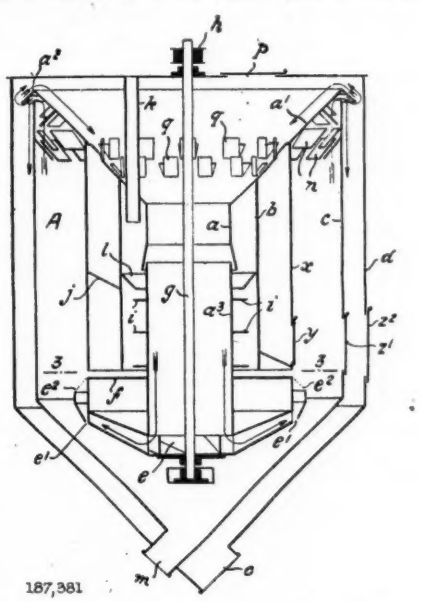
horizontal plates 20, so that they may be heated by the passag. of steam around them from the inlet 34 to the outlet 36 Spent acid is received in a chamber 40 and traces of ether and alcohol are vaporised by means of a jacket 44 through which steam is circulated. The vapour from the units 10 passes into a chamber 38, and thence to a neutralising and rectifying apparatus. Sulphuric acid is fed to the top of each unit through pipes 52 in sufficient quantity to balance exactly the depletion of acid by water and other by-products. Alcohol vapour from a superheater is admitted by a pipe 42, and passes upwards through the heating units containing the sulphuric acid. The spent acid is maintained at a constant level in the chamber 40, and is discharged by pipes 70. The chambers 10 are preferably made from lead castings of about 6 in. diameter, and are maintained at a temperature of about 125° C.

187,375. METAL OXIDES, PROCESS FOR THE REDUCTION OF—BY MEANS OF ALUMINIUM IN THE FURNACE. P. C. Rushen, London. From Akt.-Ges. B. Felder-Clement, Lucerne, Switzerland. Application date, August 13, 1921.

In the reduction of the oxides of metals such as tungsten, molybdenum, chromium, or titanium, the oxide is usually mixed with aluminium powder, but the reduced metal is then contaminated with aluminium oxide. Fluxes such as fluorspar are sometimes added to reduce the intensity of the reaction, but this tends to reduce the reaction temperature. In the present invention, the metal oxide is not mixed with the aluminium, and the latter is preferably in a compact form. The metallic oxide and the reducing agent separate into layers when heated, and penetration of the aluminium or aluminium oxide into the reduced metal is avoided. The process may be applied to the production of bars of tungsten or the like by filling an aluminium tube with the oxide to be reduced, and then heating the aluminium tube in a tube which serves as a crucible. In another example, a cylindrical fireproof crucible is lined with a sheet of aluminium of the required weight and packed with titanium oxide. The crucible is then heated in an oil-fired furnace, and the liquefaction of the contents of the cylinder forces the corundum produced outwards and upwards to form a fused layer which floats on the reduced metal.

187,381. SEPARATING FINE MATERIAL, METHOD OF AND APPARATUS FOR. G. Roth, Bessungerstrasse 87, Darmstadt, Germany. Application date, August 15, 1921.

Four cylinders *a*, *b*, *c*, *d* are arranged concentrically, and the innermost cylinder *a* is expanded into a cone a^1, which has an extension a^2 projecting downwards. A suction pipe a^3 is carried by the rotating shaft *g*, which also carries a centrifugal blower *e*. The latter carries a horizontal spreader plate *f* and a coarse sieve e^2 enclosing the outlet of the blower, while openings e^1 are also provided. The material to be separated is supplied by the pipe *k* to a hopper *l* from which it passes to rotating spreading plates *i*. The material is thus distributed uniformly over the plate *f* and is caught by the

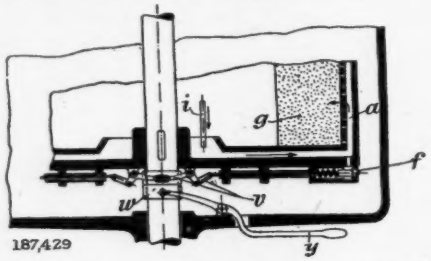


current of air from the blower *e* and projected upwards into the annular space A. The coarser portions are deflected by the sieve e^2 outwards, and pass in front of the openings e^1. Any fine material remaining is again carried upwards by air issuing from the openings e^1, while the separated coarse material is discharged at the outlet *m*. The fine material is carried upwards by the air current, and any heavy particles remaining are intercepted by overlapping baffle plates *n*. The fine material separates in the outer annular space, and is finally discharged through the outlet *o*. The air containing the residue of fine material returns to circulation through the suction tube a^3. Some of the fine material contained in the air which passes through the hopper a^1 is intercepted by baffles *q* and passes into a receiver *x*, from which it may be removed through doors *y*, z^1, z^2. A slight modification of this apparatus is also described.

187,429. WASHING MATERIAL WHICH HAS BEEN SEPARATED BY CENTRIFUGAL ACTION, APPARATUS FOR. Chemische Fabrik Griesheim-Elektron, Gutleutstrasse 31, Frankfurt-on-Main, Germany, and F. Sander, Wingertstrasse 4, Griesheim-on-Main, Germany. Application date, September 24, 1921.

This invention relates to centrifugal separators in which the solid matter is deposited by centrifugal force on the impermeable cylindrical wall of a rotating vessel. The separated liquid occupies the inner part of the vessel and escapes over the inner rim. In such centrifugal apparatus, difficulties are experienced in washing the solid matter,

since any water passed through the apparatus does not displace the heavier solution from the deposited solids. In the present invention the washing water is supplied by a pipe *i* to radial conduits in the rotating vessel from which the water passes to an annular space *a* between an outer wall and an inner perforated wall of the vessel. The latter is covered by filter cloth to retain the solid material, but the separated liquid does not pass through the perforated wall since there is no outlet from the space *a*. The deposited solid material *g* is washed by the passage of water radially inwards through it from the space *a* to the overflow rim. The washing water may alternatively be supplied to perforated pipes



embedded in the material near the outer perforated wall. The water in the space *a* may be discharged during the running of the apparatus by means of the spring-controlled valve *f*, which is operated by a handle *y* through a ring *w* on the shaft, and levers *v*.

NOTE.—Abstracts of the following specifications, which are now accepted, appeared in THE CHEMICAL AGE when they became open to inspection under the International Convention: 166,541 (Deutsche Glühfadenfabrik, R. Kurtz and P. Schwarzkopf Ges.) relating to apparatus for purifying hydrogen see Vol. V., p. 384; 172,958 (G. Scheib and M. Koch) relating to the manufacture of pure nitrogen-carbonic-acid mixture from combustion gases, see Vol. VI., p. 209.

International Specifications not yet Accepted

186,316. REMOVING SULPHURETTED HYDROGEN FROM GASES. Ges. für Kohlentechnik, 26, Deutsche Strasse, Dortmund, Germany. International Convention date, September 20, 1921.

The gas to be purified is washed with a solution of a nickel salt, to which may be added a salt which does not precipitate nickel or which forms a nickel compound soluble in alkaline solutions. Nickel sulphide is precipitated by the sulphuretted hydrogen and the solution is regenerated by blowing air through it, while sulphur is precipitated. The substances which may be added to the nickel solution comprise ammonia, pyridine, salts of organic acids, ammonium chloride, ammonium sulphate, and sodium chloride.

LATEST NOTIFICATIONS.

188,632. Process for dyeing wool with dyestuffs capable of being chromed. Akt.-Ges. Für Anilin-Fabrikation. November 7, 1921.

188,634. Methods and processes for the leaching of caliche and for the recovery of nitrate therefrom. Guggenheim Bros. November 7, 1921.

188,651. Ammonia synthesis autoclave. Nitrogen Corporation. November 9, 1921.

188,652. Drying gases. Nitrogen Corporation. November 9, 1921.

188,662. Process for the production of stable compounds of calcium hypochlorite. Chemische Fabrik Griesheim-Elektron. November 8, 1921.

Specifications Accepted, with Date of Application

168,867. Gases, Washing and displacement of. P. Kestner. September 9, 1920.

169,962–170,562. Substances of the fatty acid type, Process for the manufacture of. M. Melamid. October 2 and 20, 1920. 170,562 addition to 169,962.

173,479. Lactic acid, Process of purifying. J. Schatzkes. December 27, 1920.

173,501–188,247. Washing and separating apparatus. A. Jacquelin. December 28, 1920, and December 20, 1921. 188,247 addition to 173,501.

175,238. Alcohols, Manufacture of. Badische Anilin und Soda Fabrik. February 10, 1921. Addition to 158,906.

188,008. Oil of turpentine, Process for obtaining an oil having the chemical properties of. C. Lefebure. May 9, 1921.

188,010. China clay, Manufacture of. N. Testrup and Techno-Chemical Laboratories, Ltd. May 30, 1921.

188,019. Solid carboniferous matter, Distillation of. C. P. Markham and Staveley Coal and Iron Co., Ltd. June 28, 1921.

188,042. Electrolytically oxidising or reducing substances, Process and apparatus for. C. J. Thatcher. July 28, 1921.

188,056. Electrolytic cell. C. J. Thatcher. July 29, 1921.

188,058. Petrol, Production of. F. Tinker. July 29, 1921.

188,059. Filters. L. C. Davis. July 29, 1921. Addition to 149,808.

188,073. Gas, Manufacture of. D. J. Young. August 2, 1921.

188,127. Salts of acridinium compounds, Manufacture of. R. B. Ransford. (L. Cassella and Co. Ges.). September 1, 1921.

188,193. Gas purifiers. R. and J. Dempster, Ltd., and R. W. Broadhead. October 26, 1921.

188,208. Treating certain waste liquors and obtaining valuable products therefrom. Silver Springs Bleaching and Dyeing Co., Ltd., and A. J. Hall. November 11, 1921.

Applications for Patents

Ashworth, A. Machines for dyeing, etc., yarns in hanks, etc 31198. November 15.

Atack, F. W., Jacobson, B. H., and Thompson, W. P. Manufacture of aluminium chloride. 30933. November 13.

Babcock and Wilcox, Ltd., and Deutsche Babcock and Wilcox Dampfkessel-Werke Akt.-Ges. Ash, etc., collecting and air-sealing devices for travelling grates. 31014. November 13.

Barbet et Fils et Cie, E. Production of alcohol. 31258. November 15. (France, November 15, 1921.)

Blattner, R. H. D. and Grouchkine, L. Manufacture of caustic alkali. 31370. November 16.

British Dyestuffs Corporation, Ltd., Green, A. G., and Saunders, K. H. Methods of dyeing artificial silk, etc. 31382. November 16.

British Dyestuffs Corporation, Ltd., Green, A. G., and Saunders, K. H. Methods of printing fabrics containing fibres of acetate silk. 31383. November 16.

Clayton, A., and Holliday and Co., Ltd., L. B. Colouring matters. 31413, 31427. November 17.

Cocksedge, H. E. Production of a sodium compound. 31184. November 15.

Coley, H. E. Apparatus for reduction of ores or oxides. 31321. November 16.

Coley, H. E. Apparatus for manufacture of zinc, etc. 31322. November 16.

Daniels, W. Manufacture of crystallised carbonate of soda. 30964. November 13.

Dunstan, A. E., and Thole, F. B. Utilisation of alcohol in production of liquid fuel. 31314. November 16.

Gas Light and Coke Co., Lewcock, W., and Voss, W. A. Manufacture of sulphurised dyes. 31595. November 18.

Gas Light and Coke Co., Shannan, W. V., and Siderfin, N. E. Conduct of chemical reactions involving use of gases, etc., under pressure. 31596. November 18.

Gas Light and Coke Co., Shannan, W. V., and Siderfin, N. E. Crystallisation. 31597. November 18.

Holliday and Co., Ltd., L. B. Colouring matters. 31406. November 17.

Imray, O. Y., and Soc. of Chemical Industry in Basle. Manufacture of azo dyestuffs. 31254. November 15.

Lever Bros., Ltd., Tainsh, P. W., Thomas, R., and Williams E. T. Manufacture of caustic soda. 31516, 31517. November 17.

Llewellyn, W. B., Spence, F., and Spence and Sons, Ltd. Production of aluminous compounds. 31211. November 15.

Marmite Food Extract Co., Ltd., and Sevang, H. Petersen. Manufacture of yeast. 31609. November 18.

Masterman, A. T., and Weygang, C. Treatment of oils and fats for fuel, soap, etc. 31172. November 14.

Pereira, H. Process for manufacturing dioxyperylene. 31257. November 15. (Austria, January 7.)

Soc. Chimique des Usines du Rhône. Manufacture of calcium salt of acetylsalicylic acid. 31384. November 16. (Germany, December 6, 1921.)

Thermal Industrial and Chemical (T.I.C.) Research Co., Ltd. Method of distillation. 31012. November 13.

Distribution of Reparation Dyestuffs

IN connection with the distribution of the dyestuffs which are being obtained from Germany as reparation, a list of the products comprised in the stocks now available has been prepared, and may now be obtained by all firms interested on application to the British Dyestuffs Corporation, Ltd., Reparation Department, 70, Spring Gardens, Manchester. The Corporation will also supply on application any further particulars, together with samples, etc., of the products available.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

LONDON, NOVEMBER 23, 1922.

THE volume of business reported during the past week has been rather less. This is thought to be due to the disturbance caused by the General Election. On the whole, the outlook is fairly healthy, and prices generally are well maintained.

Rather more business has been passing for export.

General Chemicals

ACETONE is practically unobtainable for prompt delivery, and whilst further supplies are expected about the end of the month, the price is again firm, in sympathy with the advance in acetate of lime.

ACID ACETIC is in fairly good demand, and the article exhibits a harder tendency, due to the advance in raw material.

ACID CITRIC is uninteresting.

ACID FORMIC has been in better request, especially for export. The price is maintained.

ACID OXALIC has been a slow market with value unaltered.

ACID TARTARIC.—Business is of the hand-to-mouth variety, and the article does not show any further decline in price.

ARSENIC is scarce in all positions, and the tendency is towards still higher figures.

BARIUM CHLORIDE is lifeless. The price is rather easier.

CREAM OF TARTAR is lower for prompt delivery in consequence of forced offerings of second-hand parcels. For forward delivery the market is a little firmer.

FORMALDEHYDE has advanced in price, consequent upon the advance in methyl alcohol.

LEAD ACETATE is in good inquiry, and price tends upwards.

LEAD NITRATE is unchanged.

METHYL ALCOHOL.—A substantial advance is indicated by the foreign refiners.

POTASSIUM CARBONATE.—The market remains overstocked. Prices seem likely to go lower.

POTASSIUM PERMANGANATE.—A fair turnover is evident; price unchanged.

SODIUM ACETATE has advanced in price, and is scarce for delivery during the next six months.

SODIUM HYPOSULPHITE.—Unchanged.

SODIUM PRUSSIATE remains a firm market, with makers well sold for the first half of next year.

ZINC OXIDE.—Unchanged.

Coal Tar Intermediates

There is no change to report from last week in this section, business continuing on quiet lines both for home and export.

ALPHA NAPHTHOL.—Some decent home trade business is in the market and the price is firm.

ALPHA NAPHTHYLAMINE is quiet.

ANILINE OIL is a steady home trade at last quoted price.

BENZIDINE BASE is unchanged, with steady home business passing and some export enquiry.

BETA NAPHTHOL is without special feature.

BINITROTOLUOL.—Some home inquiry has been received.

DIMETHYLANILINE is steady and the market is quiet.

DIPHENYLAMINE is firm with home business in the market.

G. SALT is quiet.

H. ACID passes regularly into consumption.

METAPHENYLENEDIAMINE is unchanged.

NAPHTHIONATE OF SODA.—Orders have been placed on home account.

R. SALT.—Some home business at last quoted price.

RESORCIN is unchanged.

Coal Tar Products

There is no great change to report in the position of this market from last week.

90's BENZOL is in moderate demand, and is worth 1s. 8d. to 1s. 9d. per gallon in the North, and 1s. 11d. to 2s. per gallon in London.

PURE BENZOL is in poor demand, and is worth about 2s. per gallon on rails in the North, and 2s. 3d. to 2s. 4d. per gallon in London.

CREOSOTE OIL is strong, with an active demand for export, and is worth about 6¼ to 6½d. per gallon in the North, and 7¼d. to 7¾d. per gallon in the South.

CRESYLIC ACID has a poor inquiry, and the pale quality is worth about 2s. per gallon on rails, while the dark quality, 95/97%, is worth about 1s. 9d. per gallon on rails.

SOLVENT NAPHTHA has a moderate demand, and is quoted at 1s. 8d. to 1s. 9d. per gallon on rails in the North, and 1s. 10d. to 1s. 11d. per gallon in London.

HEAVY NAPHTHA has also a poor inquiry, and is quoted at 1s. 6d. per gallon on rails.

NAPHTHALENE.—A fair amount of business has been done for crude qualities, which are worth about £7 to £8 per ton on rails, while hot pressed is worth about £8 10s. per ton.

PITCH.—There is a lull in the demand, but quotations remain unchanged. To-day's prices may be taken at 120s. to 122s. 6d. per ton f.o.b. East Coast, and 122s. 6d. to 125s. f.o.b. London. There are buyers for forward delivery at a discount on prompt prices, but manufacturers show little disposition to accept any reduction.

Sulphate of Ammonia

The position is unchanged. There is some inquiry for export, but the home trade appears to be quiet.

Current Prices

Chemicals

	Per	£	s.	d.		£	s.	d.
Acetic anhydride	lb.	0	1	8	to	0	1	10
Acetone oil	ton	80	0	0	to	82	10	0
Acetone, pure	ton	130	0	0	to	135	0	0
Acid, Acetic, glacial, 99–100%	ton	67	0	0	to	68	0	0
Acetic, 80% pure	ton	43	0	0	to	44	0	0
Arsenic, liquid, 2000 s.g.	ton	67	0	0	to	70	0	0
Boric, cryst.	ton	55	0	0	to	60	0	0
Carbolic, cryst. 39–40%	lb.	0	0	7	to	0	0	7½
Citric	lb.	0	1	9	to	0	1	10
Formic, 80%	ton	59	0	0	to	60	0	0
Gallic, pure	lb.	0	3	0	to	0	3	3
Hydrofluoric	lb.	0	0	7½	to	0	0	8½
Lactic, 50 vol.	ton	41	0	0	to	43	0	0
Lactic, 60 vol.	ton	43	0	0	to	44	0	0
Nitric, 80 Tw.	ton	27	0	0	to	29	0	0
Oxalic	lb.	0	0	7½	to	0	0	7½
Phosphoric, 1.5	ton	40	0	0	to	42	0	0
Pyrogallic, cryst.	lb.	0	5	9	to	0	6	0
Salicylic, Technical	lb.	0	1	0	to	0	1	2
Salicylic, B.P.	lb.	0	1	4	to	0	1	5
Sulphuric, 92–93%	ton	6	10	0	to	7	10	0
Tannic, commercial	lb.	0	2	3	to	0	2	9
Tartaric	lb.	0	1	2½	to	0	1	3
Alum, lump	ton	10	0	0	to	10	10	0
Alum, chrome	ton	27	0	0	to	28	0	0
Alumino ferric	ton	9	0	0	to	9	5	0
Aluminium, sulphate, 14–15%	ton	10	10	0	to	11	0	0
Aluminium, sulphate, 17–18%	ton	11	10	0	to	12	0	0
Ammonia, anhydrous	lb.	0	1	6	to	0	1	8
Ammonia, .880	ton	33	0	0	to	35	0	0
Ammonia, .920	ton	21	0	0	to	23	0	0
Ammonia, carbonate	lb.	0	0	4	to	0	0	4½
Ammonia, chloride	ton	60	0	0	to	65	0	0
Ammonia, muriate (galvanisers)	ton	35	0	0	to	37	10	0
Ammonia, nitrate (pure)	ton	35	0	0	to	40	0	0
Ammonia, phosphate	ton	65	0	0	to	68	0	0
Ammonia, sulphocyanide	lb.	0	1	10	to	0	2	0
Amyl acetate	ton	175	0	0	to	185	0	0
Arsenic, white, powdered	ton	52	0	0	to	55	0	0
Barium, carbonate, 92–94%	ton	15	0	0	to	16	0	0
Barium, Chlorate	ton	65	0	0	to	70	0	0
Barium Chloride	ton	19	0	0	to	20	0	0
Nitrate	ton	27	10	0	to	30	0	0
Sulphate, blanc fixe, dry	ton	20	10	0	to	21	0	0
Sulphate, blanc fixe, pulp	ton	10	5	0	to	10	10	0
Sulphocyanide, 95%	lb.	0	1	0	to	0	1	3

	Per	£	s.	d.		£	s.	d.
Bleaching powder, 35-37%	ton	12	0	0	to		—	
Borax crystals	ton	28	0	0	to	32	0	0
Caffein	lb.	0	13	0	to	0	14	0
Calcium acetate, Brown	ton	10	10	0	to	11	10	0
,, ,, Grey	ton	15	10	0	to	16	0	0
Calcium Carbide	ton	16	0	0	to	17	0	0
Chloride	ton	6	0	0	to		—	
Carbon bisulphide	ton	50	0	0	to	52	0	0
Casein technical	ton	47	0	0	to	55	0	0
Cerium oxalate	lb.	0	4	6	to	0	4	9
Chromium acetate	lb.	0	1	1	to	0	1	3
Cobalt acetate	lb.	0	6	0	to	0	6	6
Oxide, black	lb	0	9	6	to	0	10	0
Copper chloride	lb.	0	1	2	to	0	1	3
Sulphate	ton	26	10	0	to	27	0	0
Cream Tartar, 98-100%	ton	100	0	0	to	102	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde, 40% vol.	ton	82	10	0	to	85	0	0
Formusol (Rongalite)	lb.	0	2	6	to	0	2	9
Glauber salts, commercial	ton	5	0	0	to	5	10	0
Glycerine, crude	ton	65	0	0	to	67	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	4	to	0	2	5
Iron perchloride	ton	30	0	0	to	32	0	0
Iron sulphate (Copperas)	ton	3	10	0	to	4	0	0
Lead acetate, white	ton	43	0	0	to	45	0	0
Carbonate (White Lead)	ton	42	0	0	to	47	0	0
Nitrate	ton	44	10	0	to	45	0	0
Litharge	ton	35	10	0	to	36	0	0
Lithopone, 30%	ton	23	10	0	to	24	0	0
Magnesium chloride	ton	5	10	0	to	6	0	0
Carbonate, light	cwt.	2	10	0	to	2	15	0
Sulphate (Epsom salts commercial)	ton	7	10	0	to	8	0	0
Sulphate (Druggists')	ton	11	0	0	to	11	10	0
Manganese Borate, commercial	ton	65	0	0	to	75	0	0
Sulphate	ton	60	0	0	to	62	0	0
Methyl acetone	ton	70	0	0	to	75	0	0
Alcohol, 1% acetone	ton	105	0	0	to	110	0	0
Nickel sulphate, single salt	ton	49	0	0	to	51	0	0
Ammonium sulphate, double salt	ton	51	0	0	to	52	0	0
Potash, Caustic	ton	32	0	0	to	33	0	0
Potassium bichromate	lb.	0	0	6	to		—	
Carbonate, 90%	ton	31	0	0	to	33	0	0
Chloride, 80%	ton	12	0	0	to	12	10	0
Chlorate	lb.	0	0	4½	to	0	0	5
Metabisulphite, 50-52%	ton	84	0	0	to	90	0	0
Nitrate, refined	ton	43	0	0	to	45	0	0
Permanganate	lb.	0	0	8½	to	0	0	9
Prussiate, red	lb.	0	4	6	to	0	4	9
Prussiate, yellow	lb.	0	1	6½	to	0	1	7½
Sulphate, 90%	ton	13	0	0	to	13	10	0
Salammoniac, firsts	cwt.	3	3	0	to		—	
Seconds	cwt.	3	0	0	to		—	
Sodium acetate	ton	24	10	0	to	24	15	0
Arseniate, 45%	ton	45	0	0	to	48	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	4¾	to		—	
Bisulphite 60-62%	ton	21	0	0	to	23	0	0
Chlorate	lb.	0	0	3¾	to	0	0	4
Caustic, 70%	ton	20	10	0	to	21	0	0
Caustic, 76%	ton	21	10	0	to	22	10	0
Hydrosulphite, powder, 85%	lb.	0	1	9	to	0	2	0
Hyposulphite, commercial	ton	11	0	0	to	12	0	0
Nitrite, 96-98%	ton	29	10	0	to	30	0	0
Phosphate, crystal	ton	16	0	0	to	16	10	0
Perborate	lb.	0	0	11	to	0	1	0
Prussiate	lb.	0	0	11¼	to	0	1	0
Sulphide, crystals	ton	12	0	0	to	12	10	0
Sulphide, solid, 60-62%	ton	20	10	0	to	22	10	0
Sulphite, cryst.	ton	12	10	0	to	13	0	0
Strontium carbonate	ton	55	0	0	to	60	0	0
Strontium Nitrate	ton	40	0	0	to	42	0	0
Strontium Sulphate, white	ton	6	10	0	to	7	10	0
Sulphur chloride	ton	25	0	0	to	27	10	0
Sulphur, Flowers	ton	11	0	0	to	12	0	0
Roll	ton	11	0	0	to	12	0	0
Tartar emetic	lb.	0	1	3	to	0	1	4
Theobromine	lb.	0	12	6	to	0	13	0
Tin perchloride, 33%	lb.	0	1	2	to	0	1	4
Perchloride, solid	lb.	0	1	5	to	0	1	7
Protochloride (tin crystals)	lb.	0	1	5	to	0	1	6
Zinc chloride 102° Tw.	ton	21	0	0	to	22	10	0
Chloride, solid, 96-98%	ton	25	0	0	to	30	0	0
Oxide, 99%	ton	37	0	0	to	38	0	0
Dust, 90%	ton	45	0	0	to	47	10	0
Sulphate	ton	16	10	0	to	17	10	0

Coal Tar Intermediates, &c.

	Per	£	s.	d.		£	s.	d.
Alphanaphthol, crude	lb.	0	2	3	to	0	2	6
Alphanaphthol, refined	lb.	0	3	0	to	0	3	3
Alphanaphthylamine	lb.	0	2	0	to	0	2	1
Aniline oil, drums extra	lb.	0	0	10	to	0	0	11
Aniline salts	lb.	0	0	11	to	0	1	0
Anthracene, 40-50%	unit	0	0	8½	to	0	0	9
Benzaldehyde (free of chlorine)	lb.	0	3	6	to	0	4	0
Benzidine, base	lb.	0	5	0	to	0	5	3
Benzidine, sulphate	lb.	0	5	0	to	0	5	3
Benzoic acid	lb.	0	2	0	to	0	2	3
Benzoate of soda	lb.	0	2	0	to	0	2	3
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol benzoate	lb.	0	5	3	to	0	5	6
Betanaphthol	lb.	0	1	4	to	0	1	4½
Betanaphthylamine, technical	lb.	0	5	0	to	0	5	6
Croceine Acid, 100% basis	lb.	0	3	6	to	0	3	9
Dichlorbenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	2	9	to	0	3	0
Dinitrobenzol	lb.	0	1	3	to	0	1	4
Dinitrochlorbenzol	lb.	0	0	11	to	0	1	0
Dinitronaphthalene	lb.	0	1	4	to	0	1	5
Dinitrotoluol	lb.	0	1	5	to	0	1	6
Dinitrophenol	lb.	0	1	9	to	0	2	0
Dimethylaniline	lb.	0	2	6	to	0	2	9
Diphenylamine	lb.	0	4	3	to	0	4	6
H-Acid	lb.	0	6	0	to	0	6	3
Metaphenylenediamine	lb.	0	4	9	to	0	5	3
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	6	0	to	0	6	6½
Metatoluylenediamine	lb.	0	4	6	to	0	4	9
Monosulphonic Acid (2.7)	lb.	0	5	6	to	0	6	0
Naphthionic acid, crude	lb.	0	2	9	to	0	3	0
Naphthionate of Soda	lb.	0	3	0	to	0	3	3
Naphthylamin-di-sulphonic-acid	lb.	0	4	0	to	0	4	3
Neville Winther Acid	lb.	0	7	9	to	0	8	0
Nitrobenzol	lb.	0	0	9	to	0	0	9½
Nitronaphthalene	lb.	0	1	2	to	0	1	3
Nitrotoluol	lb.	0	1	0	to	0	1	2
Orthoamidophenol, base	lb.	0	12	0	to	0	12	6
Orthodichlorbenzol	lb.	0	1	0	to	0	1	1
Orthotoluidine	lb.	0	1	6	to	0	1	9
Orthonitrotoluol	lb.	0	0	8	to	0	0	10
Para-amidophenol, base	lb.	0	9	0	to	0	9	6
Para-amidophenol, hydrochlor	lb.	0	8	6	to	0	9	0
Paradichlorbenzol	lb.	0	0	6	to	0	0	7
Paranitraniline	lb.	0	3	6	to	0	3	9
Paranitrophenol	lb.	0	2	3	to	0	2	6
Paranitrotoluol	lb.	0	5	0	to	0	5	3
Paraphenylenediamine, distilled	lb.	0	10	6	to	0	10	9
Paratoluidine	lb.	0	6	0	to	0	6	6
Phthalic anhydride	lb.	0	2	9	to	0	3	0
Resorcin, technical	lb.	0	4	6	to	0	5	0
Resorcin, pure	lb.	0	6	0	to	0	6	3
Salol	lb.	0	2	0	to	0	2	3
Sulphanilic acid, crude	lb.	0	1	0	to	0	1	1
Tolidine, base	lb.	0	6	6	to	0	7	0
Tolidine, mixture	lb.	0	2	6	to	0	2	9

French Potash

THE Agricultural Information Bureau for the French Potash Mines states that a review of the trade in potash fertilisers shows the demand to be steady. Merchants are laying in stocks of lower grade salts in anticipation of a good spring demand, and a fair amount of kainit 14 per cent. is required for winter application, along with basic slag on grassland, notably in light-land districts. The prices ruling for sylvinite probably account for the greater demand as compared with muriate and sulphate, current quotations being as follows:—

	F.o.r. London. £	s.	d.
Kainit, 14 per cent.	2	0	0
Sylvinite, 20 per cent.	3	0	0
Sylvinite, 30 per cent.	4	2	6
Muriate of Potash	8	10	0
Sulphate of Potash	12	7	6

Reports from abroad indicate that export trade is satisfactory, and the production from the mines in Alsace is being well maintained.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.*

GLASGOW, NOVEMBER 22, 1922.

THERE was practically no change in the chemical market during the past week, and there is nothing of importance to record.

Industrial Chemicals

ACID ACETIC.—Glacial 98–100%, spot material scarce. Price for forward delivery £54 to £55 per ton, ex wharf; 80% pure offered at £42 to £43 per ton, c.i.f.; 80% technical £39 to £40 per ton.

ACID BORACIC.—Price now for crystal or granulated, £55 per ton; powdered, £57 per ton, carriage paid U.K.

ACID CARBOLIC (ICE CRYSTALS).—Good export inquiry. Quoted 8½d. per lb., f.o.b. U.K.

ACID CITRIC.—B.P. crystals offered at 1s. 8½d. per lb., f.o.b. U.K.

ACID HYDROCHLORIC.—Price unchanged, 6s. 6d. per carboy, ex works.

ACID OXALIC.—Moderate demand. About 7¼d. to 7½d. per lb.

ACID SULPHURIC.—144°, £4 per ton; 168°, £7 5s. per ton; de-arsenicated quality, £1 per ton more.

ACID TARTARIC.—Offered at 1s. 2d. per lb., c.i.f. prompt.

ALUM, LUMP POTASH.—Spot lots, £14 12s. 6d. per ton, ex station.

AMMONIA, ANHYDROUS.—Price 1s. 6d. to 1s. 7d. per lb., ex works.

AMMONIA CARBONATE.—Unchanged, lump, 4d. per lb.; ground, 4½d. per lb., delivered.

AMMONIA LIQUID.—880°, 3¼d. per lb.; 940°, 1¾d. per lb., ex works; containers extra.

AMMONIA MURIATE.—Grey galvanisers, £32 per ton, f.o.r. works; fine white crystals, 98/100%, £26 10s. per ton, c.i.f.

AMMONIA SULPHATE.—25¼%, £15 per ton; 25¾%, neutral, £16 3s. per ton, ex works, November-December.

ARSENIC, WHITE POWDERED.—Price now £53 to £54 per ton, ex quay.

BARIUM CARBONATE, 98/100%.—Offered from Continent at £14 per ton, c.i.f. U.K.

BARIUM CHLORIDE, 98/100%.—Quoted £18 per ton, ex wharf, early delivery.

BARYTES.—English make, finest white, £5 5s. per ton, ex works.

BLEACHING POWDER.—Spot lots, £12 15s. per ton, ex station. Continental material, £10 5s. per ton, c.i.f. U.K.

BORAX.—Crystal or granulated, £28 per ton; powdered, £29 per ton, carriage paid U.K.

CALCIUM CHLORIDE.—English make £6 per ton, ex quay. Continental offered at £4 per ton, c.i.f.

COPPER SULPHATE.—Quoted £26 per ton, ex quay.

COPPERAS, GREEN.—Moderate export inquiry. Quoted, £3 10s. per ton, ex works.

DEXTRINE.—Finest Dutch, £20 per ton, c.i.f. U.K.

FORMALDEHYDE, 40%.—Now offered at £80 per ton, ex wharf.

GLAUBER SALTS.—Spot lots, £4 to £4 10s. per ton, ex store. Offered from Continent at £3 10s. per ton c.i.f. U.K.

GLYCERIN.—1260 B.P. quality, £82 10s. per ton.

LEAD ACETATE.—White crystals, Continental, at £37 15s. per ton, c.i.f. U.K. Red, £38 15s. per ton; white, £50 15s. per ton. Carriage paid in 5 ton lots. Continental red lead offered at £34, per ton, ex store.

MAGNESITE, GROUND CALCINED.—£7 to £10 per ton, ex store, according to quality.

MAGNESIUM CHLORIDE.—Spot lots about £5 5s. per ton, ex store. Offered at £3 10s. per ton, c.i.f., early shipment.

MAGNESIUM SULPHATE (EPSOM SALTS).—Commercial quality, £7 5s. per ton; B.P. quality, £9 per ton.

NAPHTHALENE FLAKES.—Offered at £12 5s. per ton, ex works.

POTASSIUM BICHROMATE.—English makers' price, 6d. per lb., delivered.

POTASSIUM CARBONATE, 88–92%.—Spot lots £28 per ton, ex store. Offered from Continent at £26 per ton, c.i.f. U.K.

POTASSIUM CAUSTIC, 88–92%.—Spot lots quoted £29 per ton, ex store.

POTASSIUM CHLORATE.—Crystal or powdered, 3½d. per lb., ex store.

POTASSIUM NITRATE (SALTPETRE).—In little demand; £31 to £32 per ton.

POTASSIUM PERMANGANATE.—B.P. crystals about 8d. per lb. ex store.

POTASSIUM PRUSSIATE (YELLOW).—Now quoted 1s. 6½d. per lb.

POTASSIUM SULPHATE, 90%.—Quoted £13 10s. per ton, c.i.f.

SODIUM ACETATE.—On offer at £24 per ton, ex store.

SODIUM BICARBONATE.—Ref. recrystallised, £10 10s. per ton, ex quay; m.w. quality, £1 less.

SODIUM BICHROMATE.—English makers' price, 4½d. per lb. delivered.

SODIUM CARBONATE.—Soda crystals, £5 10s. to £5 15s. per ton ex quay or station; alkali, 58%, £9 2s. 6d. per ton, ex quay or station.

SODIUM CAUSTIC.—76/77%, £23 5s. per ton; 70/72%, £21 5s. per ton; 60/62%, £20 5s. per ton; 98/99%, powdered, £26 15s. to £27 15s. per ton, ex station; caustic bottoms, £11 per ton, ex store.

SODIUM HYPOSULPHITE.—Commercial quality, £11 10s. per ton, ex store; pea crystals, £17.

SODIUM NITRATE.—Refined quality, 96/98%, £12 10s. per ton, f.o.r.

SODIUM PRUSSIATE (YELLOW).—Now quoted 11¾d. per lb.

SODIUM SILICATE, 140%.—English make, £12 5s. per ton, ex station.

SODIUM SULPHATE (SALTCAKE 95%).—Price remains £4 per ton, delivered, higher prices being obtained for export.

SODIUM SULPHIDE, 60/62% Conc.—Offered at £14 10s. per ton, c.i.f. U.K.

SULPHUR.—Government surplus stock of Sicilian thirds still available at £3 10s. to £3 15s. ex depot; flowers, £11 per ton; roll, £10 per ton; rock, £9 per ton; ground, £9 per ton. Prices nominal.

TIN CRYSTALS.—Unchanged at 1s. 2d. per lb.

ZINC CHLORIDE, 98/100%.—White powder offered at £20 per ton, c.i.f. U.K.

NOTE.—The above prices are for bulk business and are not to be taken as applicable to small parcels.

Coal Tar Intermediates and Wood Distillation Products

BENZIDINE BASE.—Export inquiry. Price quoted, 6s. 6d. per lb. 100% basis.

BETA NAPHTHOL.—Export inquiry. Price quoted, 1s. 2d. per lb. f.o.b.

BRÖNNERS ACID.—Home inquiry. Price quoted, 7s. 4d. per 100% basis, carriage paid.

DIMETHYLANILINE.—Export inquiry. Price quoted, 2s. 7d. per lb. f.o.b., drums included.

DIPHENYLAMINE.—Price 4s. 1d. to 4s. 2d. per lb.

GAMMA ACID.—Export inquiry. Price 13s. 9d. per lb. 100% basis, f.o.b.

"H" ACID.—Home and foreign inquiries. Price 5s. 9d. per lb. delivered or f.o.b. 100% basis.

METANITRANILINE.—Export inquiry. Price quoted, 5s. 6d. per lb. f.o.b.

METATOLUYLENEDIAMINE.—Export inquiry. Price quoted, 5s. per lb. f.o.b.

ORTHODICHLORBENZENE.—Home inquiry. Price quoted, £60 per ton, delivered.

PARADICHLORBENZENE.—Inquiries for home and export. Price, £50 per ton delivered, or f.o.b.

PARAPHENYLENEDIAMINE.—Export inquiry. Price quoted, 12s. per lb. 100% bgsis, f.o.b.

PARATOLUIDINE.—Export inquiry. Price, 5s. 3d. per lb. f.o.b.

PICRIC ACID.—Small home inquiry. Price quoted, 9d. per lb. at makers' works.

The Manchester Chemical Market

(From our Own Correspondent.)

Manchester, November 23, 1922.

There has been very little life in the chemical market here this week, and business has been anything but active. There is still a fairly substantial demand from a few of the more favourably-situated chemical-consuming industries, but the home demand generally is quiet at the moment, the depression in a large section of the Lancashire cotton trade making its effect felt in the orders for many of the principal lines of heavy chemical products. On the export side, Continental demand is practically at a standstill, little or no business being put through. Colonial inquiry, however, is still very brisk and constitutes nearly the whole of the foreign trade that is being done.

Heavy Chemicals

Caustic soda is rather quiet for home consumption, though shipments to the Colonies are still active; quotations are £21 per ton for 70 per cent. strength, and £23 for 76 per cent. Soda crystals are in fair demand and steady at £5 12s. per ton, delivered. Saltcake is firmer and scarce for prompt shipment, the price being now about £4 5s. per ton. Bleaching powder is firm and in good inquiry at £12 to £12 10s. per ton, in softwood casks. Sodium sulphide is quiet and about unchanged at £17 10s. for 60-65 per cent. concentrated, with Continental supplies offering at about 20s. less; crystals are quoted £11 per ton. Glauber salts are inactive at £4 10s. per ton. Ammonia alkali is firm at £7 17s. 6d. per ton for 58 per cent. material, with a moderate amount of business passing. Bicarbonate of soda is steady at £10 10s. per ton, in 2-cwt. bags, carriage paid. Hyposulphite of soda is quiet and unchanged at £18 10s. for photographic crystals, and £10 10s. per ton for commercial. Nitrite of soda is in moderate demand, with spot supplies rather scarce; the price keeps firm at about £28 per ton. Phosphate of soda is still rather neglected, and easier at about £14 10s. per ton. Prussiate of soda is steady at 10¾d. to 11d. per lb., with supplies rather short. Continental makes of chlorate of soda are offered at about 2¾d. per lb., but not much trade is being done. Bichromate of soda is rather quiet at 4½d. per lb., delivered. Acetate of soda is firm and continues in good demand at £23 per ton.

Caustic potash is firm at £28 per ton for 88-90 per cent. strength, with a fairly active demand. Bichromate of potash is quietly steady at 6d. per lb. Yellow prussiate of potash is still scarce for spot and near delivery at about 1s. 6d. per lb.; red firm at 4s. 3d. Carbonate of potash meets with a good inquiry at £29 per ton for 96-98 per cent. material. Chlorate of potash is quiet but firm at 3¾d. per lb. Permanganate of potash is selling very sparingly at 7d. to 7½d. per lb.

A number of foreign inquiries for sulphate of copper for next year's delivery are reported, but little actual business; prices are unchanged at £26 to £27 per ton, f.o.b. Arsenic is both scarce and in good demand, and white powdered, Cornish makes, is now quoted here at up to £56 per ton. Commercial Epsom salts are quiet but steady at about £5 15s. per ton. Spot parcels of acetate of lime are still rather scarce; grey is quoted at £15 10s., and brown at £8 5s. per ton. Nitrate of lead is unchanged at £42 to £43 per ton, with little business passing. White sugar of lead is quiet and a shade easier at about £37, with brown at £33 to £34 per ton. Ammonium muriate keeps firm at about £35 for grey and £40 per ton for white. Alum is only in moderate demand at £13 10s. per ton for loose lump, delivered.

Acids and Tar Products

Tartaric and citric acids are still very quiet sections, but prices have not altered from last report, tartaric being quoted at 1s. 2d. and citric at 1s. 9d. per lb. for B.P. crystals. With a continued steady demand for acetic acid, prices hold very firm at £65 for glacial and £40 per ton for 80 per cent. technical. Oxalic acid keeps quiet at about 7d. per lb. Crystallised boracic acid is steady at last week's reduction to £55 per ton.

Pitch is scarce and well called for for export at £6 to £6 5s. per ton, f.o.b., Manchester. The position of carbolic acid crystals has improved, and 7d. to 7½d. per lb. is now being asked. Crude carbolic acid is firm at 2s. 3d. to 2s. 6d. per gallon for 60 per cent. material. Benzole is still very dull, although there is no change from last week's price of 1s. 8d. per gallon. Solvent naphtha is quiet but steady at 1s. 9d. to 1s. 10d. per gallon for 90-160. Creosote oil is again firmer at 6½d. to 7d. per gallon. Naphthalene is unchanged in position or price, with up to £7 per ton quoted for crude, £17 for flake, and £15 per ton for crystals.

The Nitrate Market Position

Progress of the German Negotiations

In their report on the nitrate of soda market, dated November 20, Aikman (London), Ltd., state that since November 6 the arrivals amount to about 52,000 tons, and about 40,000 tons are due during the next fortnight. The market has been completely disorganised during the fortnight owing to the wide fluctuations in Continental currencies, and resellers in local markets, seeing a large profit on former purchases in their own currency, were at one time reselling at the sterling equivalent of about £11 10s. per ton delivered, or about 20s. per ton below the cost of combining. In the closing days, however, with the improvement in exchange, the market has become more stable, and values in France and Belgium are about £11 15s. to £12 for spot and £12 5s. to £12 10s. per ton for spring delivery.

Next Season's Consumption

Apart from the sale of several end-October sailing liner parcels at 11s. 7½d. per cwt. c.i.f., no business was reported in cargoes, the values of which remain unchanged at about 11s. 7½d. to 11s. 10½d. for due and November shipment and 11s. 10½d. to 12s. 3d. per cwt. c.i.f. for December-February shipment basis Bordeaux/Hamburg range. Notwithstanding the temporary disorganisation of markets Continental dealers remain optimistic about next season's consumption. The Producers' Association have sold during the fortnight about 76,000 tons, making their total sales to date about 1,023,000 English tons. Of the past fortnight's sales about 65,000 tons were for shipment to the United States, where the demand continues very active.

German Synthetics

A further increase in the price of German synthetic nitrogen products was announced on the 16th inst., nitrate of soda being raised from 576.10m. to 992.50m., sulphate of ammonia from 477.60m. to 822.60m., and cyanamide from 425m. to 731.90m., all per unit of nitrogen per 100 kilos. Negotiations are still going on for the sale of Chilean nitrate to Germany, but some delay is anticipated owing to the fall of the German Government.

The shipment figures for first half November (in tons) are cabled as follows: To Europe and Egypt, 90,000 against 12,000 in 1921, 25,000 in 1920, and 91,000 in 1913; to United States, 53,000 against 5,000 in 1921, 20,000 in 1920, and 17,000 in 1913; to Japan and other countries, 10,000 against 3,000 in 1921, 3,000 in 1920, and 10,000 in 1913.

Freights are very firm, and with better rates offering from the River Plate and Peru tramp steamers are held for 33s. to 34s. per ton for nitrate basis Bordeaux/Hamburg range. Liner space is, however, still offered at 29s. 6d. to 30s. per ton for December/March shipment.

A serious earthquake and tidal wave was reported on the Chilean coast, but, so far as can be ascertained, no damage was sustained by the nitrate oficinas, and only slight damage to the Southern nitrate loading ports.

Prices of sulphate of ammonia are unchanged.

Chemical Engineering Group

A joint meeting of the Manchester Section of the Society of Chemical Industry and the Chemical Engineering Group, under the chairmanship of Dr. E. Ardern, will be held at "The Textile Institute," St. Mary's Parsonage, Manchester, on Friday, December 1, at 7 p.m., when a paper on "The Chemical Engineering of Paper Manufacture" will be read by Mr. W. G. Fraser. The paper will deal very shortly with the broad outlines of historical development, which will be followed by a short description of modern methods. Certain outstanding chemical engineering problems arising in conducting various processes in the manufacture will be touched upon, and figures of performance, and questions of steam and power consumption will briefly be dealt with. All interested in this most important subject are cordially welcomed to the meeting.

Company News

CHLORIDE ELECTRICAL STORAGE CO.—An interim dividend of 5 per cent. free of tax has been declared on the ordinary shares.

LONDON NITRATE CO.—A dividend of 1s. 6d. per share will be paid for the year to June 30 last. A similar amount was paid for the previous year.

CASTNER KELLNER ALKALI CO.—For the year to September 30 last a final dividend of 12 per cent. is payable on December 7, making 20 per cent. for the year.

PAN DE AZUCAR NITRATE CO.—A dividend of 15 per cent. less tax has been declared in respect of the year to June 30 last. Warrants will be posted on December 1.

CASSELL CYANIDE CO.—A further dividend of 6d. per share, making 9d. per share for the year to September 30 last, less tax, at 5s. 6d, is payable on December 14 to holders registered on November 20.

WILLIAM GOSSAGE AND SONS.—The transfer books of the 5 per cent. first cumulative preference shares will be closed until November 30 for the preparation of dividend warrants due on December 1.

BARKERSHAW CHEMICAL CO.—At a meeting held on October 30 it was resolved that the company be wound up voluntarily. Mr. J. W. Reynolds, 23, Bank Street, Bradford, was appointed liquidator.

NEW PEGAMOID.—After providing for taxation, the net profit for the year was £3,257, which, with £5,000 transferred for contingency account, reduces the debit balance of the previous year by £8,257 to £39,818.

BRITISH BROKEN HILL PROPRIETARY CO., LTD.—Shareholders have been informed that the directors are engaged in negotiations under which an offer for all the shares in the company, on the basis of 35s. per share, is expected to be forthcoming.

ROOIBERG MINERALS DEVELOPMENT CO.—The report for the year to June 30 last shows that £12,373 was brought in; adding £16,450 transferred from reserve to appropriation account, and deducting a loss of £11,410 for the year, there remains £17,413 to be carried forward.

DORMAN, LONG AND CO., LTD.— The directors recommend a dividend on the preferred ordinary shares at the rate of 8 per cent. per annum, less tax, for the half-year to September 30 last to shareholders registered December 3, payable December 31. No dividend will be paid on the ordinary shares. For the preceding year 5 per cent., tax free, was paid.

BRITISH CELLULOSE CO.—According to the Paris correspondent of the *Financial News*, the Société de Soie de Tubize backed the recent issue of 7 per cent. bonds of the Cellulose Co. to a total of £100,000. The Belgian Co., owing to the poor response, will find 72,000,000 Belgian francs to take up its share of the new debentures.

ZINC CORPORATION, LTD.—By a recent decision in the Court of Appeal, preference shareholders become entitled to participate in the relief obtained in respect of Dominion income tax. Consequently, income tax will be deducted at the rate of 3s. 1d. in the £ from the dividend of 2s. per share on the preference shares payable on January 2, 1923, instead of at the rate of 5s. 6d. in the £ as previously announced.

LIGHTING TRADES, LTD.—The directors report that the year's trading resulted in a loss of £35,941, to which is added depreciation of stocks, £92,741; depreciation of buildings, plant and machinery, £14,405; redundant plant written off, £37,951; forward contracts reserve, £27,059; and investment depreciation, £9,139; making a total debit balance for the year of £217,236, from which is deducted the balance brought forward, £28,118, and the preference dividend for the half-year to September 30, leaving a debit balance of £198,016 to be carried forward.

AMELIA NITRATE CO.—For the year to June 30 last the gross trading profit was £4,435, plus income on investments and transfer fees £393, and £49,907 was brought in, making £54,735. Deducting administration expenses, interest, return due to the association, stoppage expenses, loss in exchange, and depreciation, the balance is £6,711. After paying the preference dividend there remains £3,711, which the directors propose to carry forward. The crisis in the nitrate industry continued unabated during the whole period covered by accounts, and no nitrate sales whatever were made for the company's account, the profit shown being entirely derived from iodine. During the summer, however, the nitrate market experienced a marked revival. Considerable sales have been effected, and it is hoped that the demand will continue during the season. The annual meeting will be held at River Plate House, Finsbury Circus, London, E.C., on November 28, at noon.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIAL.	REF. NO.
Egypt	Drugs	D.O.T. 9409/F.E./C.P.
Brazil	Paints, oils and varnishes....	551
Belgium	Pharmaceutical and industrial chemicals	573
Liege	Aniline oil, cresylic acid, bichromate of potash and soda, boracic acid, benzene, dyeing and tanning extracts, etc.	576
Sweden	Chemicals employed in rubber factories and tanneries.	584

Government Contracts

The following were among the Government contracts let during October :—

ADMIRALTY (CONTRACT AND PURCHASE DEPARTMENT).—*Electrodes :* The Quasi-Arc Co., Ltd., London. *Glycerin :* C. Thomas and Brothers, Ltd., Bristol.

WAR OFFICE.—*Acid :* Spencer, Chapman and Messel, Ltd., London.

CROWN AGENTS FOR THE COLONIES.—*Detonators :* Curtis's and Harvey, Ltd., London. *Gunpowder :* W. H. Wakefield and Co., Ltd., Gatebeck, near Kendal. *Novarsenobillon :* May and Baker, Ltd., London.

Recent Wills

Mr. Edward Crawshaw, of Tollington Park, London, manufacturer of aniline dyes..... £1,575

Mr. John Campbell Forrest, chemical manure manufacturer, of Burnbank Cottage, Chain Road, Paisley (personal) £13,804

Conversion Tables for Oil and Chemical Trades

A BOOK of some sixty pages compiled by L. N. Rawes, and supplying in a handy form a number of useful conversion tables, for use in the oil and chemical trades, has been issued by Major and Co., Ltd., of Hull, who state in a prefatory note that the information has proved in practice to be the means of saving both time and mental effort. The tables are clearly printed and well arranged. In the table for the conversion of pence per gallon to £ s. d. per ton, prices are given ranging from ¼d. to 1s. per gallon, and the equivalents in specific gravities of from 0·700 to 1·290 are separately shown. Another table deals in a similar manner with conversions from shillings per ton to pence per gallon, while other tables give pence per gallon to shillings per 100 kilos, pence per gallong to cents per American gallon, shillings per 100 kilos to pence per gallon, and cents per gallon to pence per gallon. There is also a table of specific gravities, showing gallons to the ton, comparisons of temperatures, average dimensions of barrels and drums, weight of the contents of usual containers, and other useful data. Examples given at the end of the book illustrate the use of the various tables.

Coal, Peat and Oil, Ltd.

Prospects of Reconstruction

A MEETING of the creditors of Coal, Peat and Oil, Ltd., was held on Tuesday, at the Institute of Chartered Accountants, Moorgate Place, London. Lieut.-Col. Grimwood, the liquidator of the company, in the chair. A statement of affairs prepared as at November 3, showed ranking liabilities of £5,306 7s., of which £4,407 5s. 3d. was due to trade creditors and loan creditors, while £689 11s. 8d. was the unsecured portion of the claims of partly secured creditors. The National Provincial and Union Bank were stated to be creditors for £2,715, but they held the guarantee of the directors, and also a charge on the value of the patents, the latter being placed at £3,724. The partly secured creditors were the first and second mortgagors on Alsager Moor. With regard to the assets, these consisted of stock-in-trade consisting of decoloriser carbon and unground carbon estimated as of the value of £510, office furniture £20, machinery and plant £500, doubtful book debts estimated at £10, and the surplus in regard to the patents £559 4s. 3d. This made a total of £1,099 4s. 3d., or an estimated deficiency of assets of £3,707 2s. 9d.

The chairman said the main asset of the business was the decoloriser process. It was rather a remarkable thing that he was making a report on a sugar factory at Cantley when he first was made aware of the new uses of this decoloriser carbon. An enormous value was attached to the carbon, which was used as a very perfect refiner of sugar juices. It was not long after that one of the directors, Mr. Leadbeater, mentioned the making of this decoloriser from peat. The finest decoloriser had first been made out of coconut shells, and it seemed that there was very little difference between the vegetable matter of a coconut shell and peat which was only a vegetable fibre also. There had been an expense on the exploitation of this decoloriser carbon of £5,350. In August, 1920, the directors provided considerable sums of money themselves, and there was a further £3,670 spent in exploitation. In 1921 the directors were satisfied that they had got this carbon down to a perfected state, for they had sold some to oil refiners and it had been eminently successful. Subsequently he (the chairman) went to a very important firm of tar distillers and asked them to look into the matter, and they kindly agreed to do so. Unfortunately that firm were large creditors to-day. The directors still further, out of their own pockets, financed the company in the hope that matters would begin to turn. At that time, however, coke was a tremendous price, and many tons of it were required to produce a ton of this flocculent carbon. What really came about he was not sure, but at all events the company just failed to achieve the desired success, although he was still satisfied that the carbon was an exceedingly valuable one.

Mr. Walker, one of the directors, said he believed that the company's process was a thoroughly good one, and that steps now being taken to establish a new company would have the effect of liquidating the whole of the unsecured indebtedness in full. He thought in fact that there was every prospect of this company being floated on a satisfactory basis.

After further discussion it was decided to confirm the appointment of Lieut.-Col. Grimwood as liquidator.

Theories of Steam Flow

PROFESSOR A. L. MELLANBY gave a lecture on "Theories of Flow of Steam and their Development" at a meeting of the Royal Philosophical Society of Glasgow, recently in which he said that even in so well-worn a path experimental investigation could still discover something new. The general phenomena associated with the flow of steam through an orifice from a vessel at high pressure to one of low pressure were first considered, and the explanation offered by Osborne Reynolds in 1886 to account for the critical pressure drop briefly given. Slides were then shown to indicate the measured pressure drops along different nozzles, and their variation from the assumed theoretical values pointed out. Examples were shown to illustrate the losses in nozzles of various types, and special attention was directed to the case of over-expansion. The effect of roughness was then considered, and illustrations given to represent the behaviour of the steam as it flowed past smooth and rough surfaces.

British Superiority in Glass Manufacture

DR. W. E. S. TURNER, who has just returned from a visit to Czecho-Slovakia, where he has been studying the position of the glass industry and the methods of manufacture, speaking to the members of the Sheffield Society of Glass Technology on Wednesday, stated that in many of the methods of glass manufacture Britain leads the European Continent. The plant laid down in many of the factories of this country was much more up-to-date than that on the Continent. The Bohemian glass industry was now in a serious position owing to the financial conditions and the high tariff wall. It would be very difficult for the manufacturers of Bohemia to renew competition with this country for some considerable time. The technical side of the glass industry had not made anything like the progress it had in this country. The industry was still living largely on old traditions, and work was carried on largely by hand. In this country we could look with some satisfaction to the fact that, despite excess profits taxes, British manufacturers had put considerable sums into the improvement and extension of their works and in new plant. He was not without hope that the result of these improvements would mean that British manufacturers would be able to make their goods cheaper and better.

Affairs of a Manufacturing Chemist

A GENERAL meeting of the creditors of Mr. J. H. R. Hex, 12, Regent Square, London, who had been interested in a manufacturing Chemist's business, was held at Bankruptcy Buildings, Carey Street, London, on Tuesday, for the purpose of considering and voting on a proposal that he had lodged for the payment of a cash composition of 7s. 6d. in the £ to his unsecured creditors. The liabilities, as shown by his statement of affairs, amount to £641, and his assets were estimated to realise £152, and the Official Receiver, in his report on the proposal, said that it was in his opinion reasonable, and calculated to benefit the general body of creditors. The Official Receiver announced that ten creditors with claims amounting to £317 voted for acceptance of the proposal, while five creditors with claims amounting to £145 were against it. Under the circumstances he had no alternative but to declare the proposal not carried, as although the majority in number accepted the proposal, the requisite three-fourths in value of all the creditors who had proved their claims was lacking. The meeting was then closed.

Fertiliser Merchant's Successful Appeal

IN the Court of Appeal on November 16, Mr. E. J. Allcoat, of Burton-on-Trent, chemical fertiliser merchant, appealed from a decision of Mr. Justice Roche, who awarded him £150 damages against Foods and Fertilisers, Ltd., of Old Market Place, Grimsby, for breach of a contract to take from him within a reasonable time delivery of 250 tons of basic slag. The judge in the court below said there was no doubt that the defendants were liable, for after the breach there was no market of which the plaintiff could reasonably avail himself, and that as a result he had lost profit.

The appeal was on the ground that the judge applied the wrong measure of damages, and that he should have awarded £468, the amount claimed. The defence was that delivery under the contract was to be as and when required, and the defendants said that they could not take delivery when expected, because of the lack of purchasers.

The appeal was allowed, with costs, the damages to which the plaintiff was entitled to be found by inquiry.

Canadian Chemical Production

THE gross value of chemicals and allied products manufactured in Canada in 1920 was approximately $122,000,000, according to a report published by the Dominion Bureau of Statistics at Ottawa. Copies of the report, which covers ten principal industries, may be had on application to the Dominion Bureau of Statistics, Ottawa.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

County Court Judgments

[*NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.*]

BOUTALL, Joseph, 46, Marchmont Street, W.C., chemist. (C.C., 25/11/22.) £23 5s. 6d. October 9.

BRITISH SUPER CARBON CO., LTD., chemical manufacturers. (C.C., 25/11/22.) £19 3s. 8d. October 9.

CLEGG, C. W., 125, King Edward Street, Grimsby, druggist. (C.C., 25/11/22.) £18 10s. October 17.

EGAN, T. F., 106, Northfield Avenue, Ealing, chemist. (C.C., 25/11/22.) £10 19s. 9d. October 9.

LENG, A. E., 205, High Street, Acton, chemist. (C.C., 25/11/22.) £11 11s. 8d. October 13.

MAYORS (CHEMISTS), LTD., Birmingham, druggists. (C.C., 25/11/22.) £14 12s. 1d. October 12.

SMITH, A. L., 169, Newfoundland Road, Bristol, chemist. (C.C., 25/11/22.) £11 6s. 3d. October 11.

THORNE, W. H. (trading as HOLT, GREEN AND CO.), 3, Pelham Street, South Kensington, W., chemist. (C.C., 25/11/22.) £15 5s. 2d. October 9.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of 1908, provides tha every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

SERRE (ACHILLE), LTD., London, E., dyers. (M. 25/11/22.) Registered November 8, £3,400 Land Registry charge, to E. A. Serre, Gifford Lodge, Twickenham Green, company director; charged on factory, etc., at Wallis Road, Hackney (subject to charge created by company's predecessors in title dated October 28, 1907, to secure £6,800. *Nil. April 19, 1922.

WAITE'S BRITISH CHEMISTS, LTD., North Shields. (M., 25/11/22.) Registered November 4, £5,000 mortgage, to North Shields Permanent Building Society; charged on 20 and 20A, King Street, and 52, Queen Street, South Shields. *£1,750. May 4, 1922.

Satisfaction

WEST RIDING CHEMICAL CO., LTD., Mirfield. (M.S., 25/11/22.) Satisfaction registered November 8, all moneys, etc., registered January 26, 1921.

London Gazette

Companies Winding-Up Voluntarily

BLASTINE EXPLOSIVES, LTD. (C.W.U.V., 25/11/22.) C. V. Allen, Nobel House, Buckingham Gate, London, S.W.1, appointed liquidator.

LAZARD GODCHAUX CO., LTD. (C.W.U.V., 25/11/22.) H. Bartram, 335, Putney Bridge Road, London, S.W., appointed liquidator.

THE BARKERSHAW CHEMICAL CO., LTD. (C.W.U.V., 25/11/22.) Meeting of creditors will be held at the offices of the liquidator, Mr. J. W. Reynolds, Incorporated Accountant, 23, Bank Street, Bradford, on November 27, 1922, at 3 p.m.

WAEN SILICA CO. (1921), LTD. (C.W.U.V., 25/11/22.) A. Yearsley, 27, Brazennose Street, Manchester, Incorporated Accountant, appointed liquidator. Meeting of creditors, 27, Brazennose Street, Manchester, on November 28, at 3 p.m.

New Companies Registered

ALPHA CHEMICAL CO., LTD. Manufacturing chemists and druggists, etc. Nominal capital £1,500 in 1,400 12 per cent. cumulative preference shares of £1 each and 800 deferred shares of 2s. 6d. each. A director: H. O. Clarke, 4, Rugby Road, Brighton.

BRADFORD PRODUCTS, LTD. Bleachers, dyers, etc. Nominal capital £500 in £1 shares. A subscriber: H. L. Marvell, 25, Scarborough Road, Shipley, Yorks.

HEALTH MACHINES, LTD., 35, Westcroft Square, Hammersmith, W. Manufacturing chemists and druggists, drysalters, etc. Nominal capital £2,000 in 1,500 preference shares of £1 each and 10,000 ordinary shares of 1s. each.

HUMAGSOLAN, LTD., Faraday House, Charing Cross Road, W.C. Manufacturers of and dealers in chemicals, drugs, perfumes, etc. Nominal capital, £5,250 in 5,000 10 per cent. cumulative participating preference shares of £1 each and 5,000 ordinary shares of 1s. each.

LEYTON MANUFACTURING CO., LTD., 37A, Hainault Road, Leytonstone, E.11. Wholesale and retail manufacturing chemists, druggists, drysalters, etc. Nominal capital £2,100 in £1 shares (2,000 preference and 100 ordinary).

ROBARTES (1922), LTD. Manufacturers of and dealers in soaps, oils, drugs, chemicals, perfumes, etc. Nominal capital £2,000 in £1 shares. A subscriber: R. S. Longley, Hyde Park Place, Leeds.

SAMUEL LAMBERT AND CO., LTD., Friars House, 39–41, New Broad Street, E.C. Drug, oil, resin, perfumery and chemical merchants. Nominal capital £1,000 in 900 preference shares of £1 each and 2,000 ordinary shares of 1s. each.

WESSEX MANUFACTURING CO., LTD., 38, Walcot Street, Bath. Importers and exporters of and dealers in oils, dyestuffs, toilet and chemical requisites, etc. Nominal capital £1,000 in £1 shares.

£150 Damages for Wrongful Dismissal

IN the High Court (Chancery Division), on November 17, before Mr. Justice Bray, Dr. Arthur Jaques, F.I.C., of Sandringham Road, Waterloo, Liverpool, sued Cumberland Coal Power and Chemicals, Ltd., for damages for wrongful dismissal and salary in lieu of reasonable notice.

Mr. Moresby, counsel for the plaintiff, stated that the defendant company had not put in an appearance, and proceeded to outline the case. The plaintiff, he said, entered into a contract of service in December, 1920, with the defendant company for a period of six months, the company having the option of renewal at the end of that time for a further period of five years. In June, 1921, the option was not exercised, but by mutual consent the employment was continued for a further six months on the same terms. At the end of this period the plaintiff continued in his employment and his orders were recognised until January 30, 1922, when his services were summarily dispensed with on the grounds that he was employed only from day to day, and that he was not further required. Counsel stated that three months' salary only was being claimed as being reasonable, as the plaintiff had secured other employment, but submitted that in the circumstances, and having regard to the nature of the employment, six months' salary could have been claimed with fairness. He intimated that should his Lordship desire he would call Mr. Mills, of the British Association of Chemists, in evidence of the custom of the profession.

His Lordship intimated that he did not desire to hear evidence, as he considered the claim reasonable. He therefore gave judgment for the plaintiff for £150 and costs on the claim.

Examination of Refractories

IN the course of a lecture on the "Micro-Examination of Refractory Materials," delivered at a meeting of the Sheffield Society of Metallurgists and Metallurgical Chemists on November 15, Mr. W. J. Rees dealt with the preparation of samples for examination, both opaque and transparent methods. The micro-structure of raw materials used for the manufacture of various types of refractories was discussed and explained by means of lantern slides of micro-sections. The changes in the structure of refractories during their use in metallurgical, and other furnaces, was discussed, and the effect of contact with slags and structure was also examined.